

MANUAL  
OF  
ELECTRICAL INSTRUCTIONS  
FOR  
SINGER FAMILY SHOPS

**SINGER\***

FAMILY SEWING MACHINE MOTORS,  
SINGERLIGHTS, CONTROLLERS,  
HAND AND FLOOR VACUUM CLEANERS,  
FLATIRONS, FANS, Etc.



THE SINGER MANUFACTURING COMPANY

\*A Trade Mark of THE SINGER MANUFACTURING COMPANY

PROPERTY OF  
THE SINGER MANUFACTURING COMPANY

This is a private and confidential communication to and for the use of only the employees of The Singer Manufacturing Company and its affiliated companies. Reproduction, sale, distribution, or publication thereof to the public is forbidden.



# BELT APPLICATION CHART

MOTOR CAT. NO.	HAND WHEELS 15282*, 54563 AND 125473. 54563 USED ON 127 AND 128 MACHINES ONLY.					HAND WHEELS 32672 AND 105072			HAND WHEEL 56136	24-68 AND 24-69	24-80	142W	221 AND 222
	15	66,127 AND 201	99 AND 128	206K1 TO 206K19	206K20 AND UP, 306	15, 66 AND 201	99	206K20 AND UP, 306	206K1 TO 206K19				
BA3, BA5	193066	193066	193066		196388	196386	198651	198651					
BA4	**	196388	196389		196388	196386	196387	198651					
BR, BR-S	193066	193066	193066	196389	196388	193077	193077	198651	196388				
BR2, BR2-S	196388	196388	196388			196386	198651						
BR-20												194144	
BS			193066										
BT	193499	193499	193499										
BU, BUE	193066	193066	193066			193077	193077			193755	193822		
BV		193066				193077							
BY	193066	193066	193066			193077	198651						
BZ	196388	196388	196389			196386	198651						
CA6, CA7													194144
MT, MUI												194144	
RF	196388	196388				196386	198651						
SER3													194144
SER4		193066	193066			193077							

\* Electric Drive not recommended with Hand Wheel No. 15282 as Motor will overheat with sustained operation.

\*\* For BA4 and BZ Motors use Belt No. 196389 in Cabinets Nos. 233, 235, 237, 239 and 240 and Belt No. 196388 in all other Cabinets.

Form 20868  
(656)

THE SINGER MANUFACTURING COMPANY

PRINTED  
IN  
U.S.A.

## PREFACE

This manual contains all of the important information covering the family type electrical apparatus manufactured by the Company. It is in loose leaf form so that sheets giving information regarding new developments may be added, thus keeping the book constantly up to date. It is divided into several sections, as explained in the table of contents, and when additional sheets are issued they must be inserted in the proper place.

(Insert in Form 20596 in place of corresponding leaf)



## TABLE OF CONTENTS

This service manual is divided into several parts with each group of apparatus or information having a Part number and each type of group having a Section number. For example: PA2 Motors are in Part 4 (Motors) Section 4 (PA2 Motors).

### PART 1—INTRODUCTION

Section 1—Questions and answers to help the salesman understand the answers he might give to customers' questions. Explanation of motor identification symbols.

Section 2—Description of series commutator type electric motor with suggestions for servicing.

### PART 2—SEWING MACHINE MOTOR APPLICATION

Section 1—Motor Application Charts

Section 2—Summary of Family Sewing Machine Motors

Section 3—Belt Application Chart

### PART 3—SPECIAL APPLICATIONS OF SEWING MACHINE MOTORS

Index for Part 3

Section 1—Family Sewing Machines with ground connection.

Section 2—Electrical Outfits for School Tables Nos. 409 and 410.

Section 3—Electrical Outfits for School Tables Nos. 411 to 416 inclusive.

Section 4—Electrical Outfits for School Tables Nos. 417, 418 and 419

Section 5—Electrical Outfits for 64" School Tables

Section 6—Conversions of School Tables

### PART 4—MOTORS—SERVICE PARTS CHARTS

Section 1—BA Motors for Family Sewing Machines

Section 2—BZ Motors for Family Sewing Machines

Section 3—PG and PH Motors for 15-91 and 201-2 Machines

Section 4—PA Motors for Class 301 Machine

Section 5—Series 3 Motor for Classes 221 and 222 Machines

Section 6—CA Motors for Classes 221 and 222 Machines

Section 7—BR and BR-S Motors for Family Sewing Machines

Section 8—RF Motors for Family Sewing Machines

Section 9—BY Motors for Family Sewing Machines

Section 10—BS Motor for 128-8 Family Sewing Machine

Section 11—BV Motor for Class 66 Family Sewing Machine

Section 12—Series 4 Motor for 66-8 and 128-8 Family Sewing Machines

Section 13—BUE Motors for Family Sewing Machines

Section 14—BU Motors for Family Sewing Machines

Section 15—BT Motors for Family Sewing Machines

### PART 5—LIGHTS—SERVICE PARTS CHARTS

Section 1—Light with Lead for Class 301 Machine

Section 2—Catalog S-4 Light

Section 3—Catalog S-1 Spotlight

Section 4—Light with Lead for Classes 201 and 221 Machines

Section 5—Catalog S-5 Spotlight

## TABLE OF CONTENTS — Continued

### PART 6—CONTROLLERS—SERVICE PARTS CHARTS

### PART 7—VACUUM CLEANERS

Section 1—Servicing instructions for S-3 floor type vacuum cleaner

Section 1A—Servicing instructions for S-2 floor type vacuum cleaner

Section 2—Servicing instructions for H-7 and H-9 hand type vacuum cleaners

Section 3—Servicing Instructions for S-4 Floor Vacuum Cleaner

### PART 8—FLATIRONS

### PART 9—FANS



**WHEN WERE THE FIRST ELECTRIC MOTORS BUILT FOR DRIVING SEWING MACHINES?**

The first electric motors for driving family sewing machines were built in 1911. Since that time the motors and other electrical apparatus on family sewing machines have been steadily improved, until at the present time SINGER\* Electric Family Sewing Machines are the finest in the field.

**TO WHAT MACHINES CAN MOTORS BE APPLIED?**

SINGER family sewing machine motors may be applied to any SINGER lock stitch family machine having the hand attachment seat to which the motor fastens. They may also be applied to chain stitch machines of the 24 class, either portable or cabinet styles. In later years sewing machines have been designed especially for electric motor drive, and in these machines the electric motor is a part of the equipment regularly furnished. Detailed charts showing the proper motors, controllers, and SINGERLIGHTS for each of the various classes of sewing machine will be found in Part 2 of this manual.

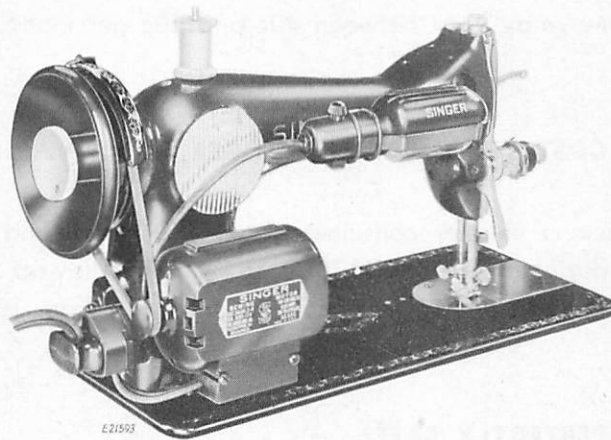


Fig. 1. Machine 15-90 Showing BA3 Motor and S4 SINGERLIGHT

**FOR WHAT ELECTRIC POWER SUPPLIES ARE THESE MOTORS FURNISHED?**

An electric motor may be obtained of the proper rating to suit almost any particular power supply available anywhere in the world. Motors for direct current and 25 to 75 cycles alternating current at 110 to 120 volts suit the electrical power supply prevailing in nearly all parts of the United States, and will be supplied unless otherwise ordered.

**HOW MUCH POWER DOES THE MOTOR USE?**

The power required to operate motors for driving family sewing machines at full speed varies from 40 watts to 60 watts, or approximately as much as an ordinary electric light bulb. Sewing machines are not operated continuously at high speed in the home, but are frequently stopped, and much of the time are run at less than full speed. Under these conditions, they use substantially less power than an ordinary 60 watt electric light bulb.

**HOW MUCH DOES IT COST TO OPERATE A SINGER ELECTRIC SEWING MACHINE?**

It depends largely upon the cost of the current per kilowatt hour, and the length of time the machine is used each day. For example, if the motor with its SINGERLIGHT\* consumes 60 watts and is operated for 3 hours each day, it will have used  $3 \times 60 = 180$  watt hours. If the machine is used at this rate for 12 days during each month, the total power used will be  $12 \times 180 = 2160$  watt hours. The user pays for electric power in units of 1000 watt hours, called a kilowatt hour. The cost of this power varies widely depending upon the amount of power used. A family with no electric refrigerator, radio, television set, or other large electrical appliances, may pay as much as 8c per kilowatt hour, in which case the cost of running the sewing machine described above would be  $2.16 \times 8 = 17.3$  or less than 18c per month.

**HOW MUCH DOES IT COST TO OPERATE A SINGER FLOOR TYPE VACUUM CLEANER?**

A SINGER floor vacuum cleaner consumes about 330 watts, and if used for 1 hour per day it will consume during one month  $330 \times 30 = 9900$  watt hours, or 9.9 kilowatt hours. Depending upon the amount of power used in the household for electrical appliances, the cost of running the vacuum cleaner may vary between 40c and 80c per month.

**HOW MUCH DOES IT COST TO OPERATE A SINGER HAND VACUUM CLEANER?**

A SINGER hand vacuum cleaner consumes about 170 watts, and if operated for  $\frac{1}{2}$  hour per day it will consume during one month  $170 \times 15 = 2.55$  kilowatt hours. Again depending upon the amount of power used by the customer, this may cost from 10c to 20c per month.

**ARE SINGER MOTORS PERFECTLY SAFE?**

They are approved by the Underwriter's Laboratories, Canadian Standards Association, and other electrical safety agencies throughout the world. The motors, controllers, SINGERLIGHTS and wiring are designed and built of the finest material and workmanship. Before being shipped from the factory, each motor is thoroughly tested to assure its safety. When any electrical device is not to be used for some length of time, however, it is suggested that the plug be removed from the outlet and the electric cord be removed from the floor where it might be subject to damage.

**AT WHAT VOLTAGE WILL THE MOTORS RUN SATISFACTORILY?**

Every electrical power supply is furnished at a certain voltage, which may be likened to the pressure in a water system. Every SINGER motor has a voltage stamped on its nameplate, and the voltage of the power supply to which the motor is connected should agree with the voltage stamped on the motor nameplate. Where a voltage range is given, the motor will operate satisfactorily within this range. Where a single voltage is given, the motor will operate satisfactorily within about 10% on either side of voltage stamped on the nameplate.



**WHAT IS A CYCLE?**

A cycle is the flow of current in one direction followed by a reversal flow in the other direction. When this happens 60 times every second, the electric power supply is known as a 60 cycle supply. This is the normal number of cycles per second, or frequency of electric supply in the United States.

**WHAT IS A VOLT?**

Electricity flowing through a wire meets resistance, and pressure is necessary to make it flow, just as water flowing through a pipe meets with friction, and pressure is necessary to keep the water flowing. Water pressure is measured in pounds per square inch. Electrical pressure is measured in volts.

**WHAT IS AN AMPERE?**

An ampere is the unit for measuring the electric current which flows through a wire.

**WHAT IS A WATT?**

The watt is a unit of electrical power. It measures the rate at which electrical energy is being supplied to a circuit.

**WHAT IS A KILOWATT-HOUR?**

A kilowatt-hour is the quantity of electrical energy used steadily at the rate of 1000 watts (1 kilowatt) for 1 hour. This is the basis on which electric light companies render their bills to customers.

**IS IT SAFE TO RUN THE MOTOR WITH THE BELT OFF?**

This is likely to damage the motor and should be avoided. In case the motor will not start the sewing machine, test it by taking the belt off the motor pulley and gently press the controller. The instant the motor starts, release the controller thus preventing the motor from reaching a high speed. If the motor starts, the trouble is probably with the sewing machine and it should be carefully lubricated and checked for tightness or damaged parts before resuming sewing.

**WHAT ATTENTION DOES THE MOTOR REQUIRE?**

Normally the motor requires no special attention, and it is best to leave it alone as long as it runs satisfactorily. If it becomes noisy or slow in time, squeeze a little SINGER\* Motor

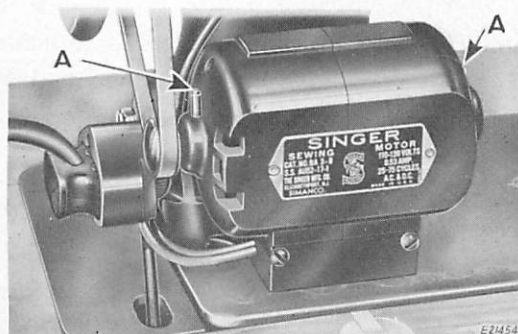


Fig. 4. Showing Lubrication Tubes (A)

Lubricant into each grease tube. Do not use oil, since this might run over on to the commutator, and impair the operation of the motor. If it fails to start or run properly, the brushes probably need renewing. Unless the customer has done this before, it would be best to bring the motor to the nearest SINGER Shop, have new brushes installed, and learn how this should be done. In ordinary service the brushes should last for several years before needing replacement. See Part 1, Section 2 for more detailed instructions.

## HOW DOES THE COMPANY GUARANTEE THE SINGER FAMILY SEWING MOTORS?

The Company stands back of its motors in exactly the same manner as it does with all its other products. They are the only sewing motors made and guaranteed by a sewing machine manufacturer.

## HOW ARE FAMILY SEWING MOTORS IDENTIFIED?

It is customary to identify a particular motor type with a catalog number consisting of two capital letters (for example BA) to indicate the general construction, followed by a number (for example BA3) to indicate the mechanical arrangement of parts to fit certain sewing machine applications. The voltage rating of the motor is identified by a dash number (for example BA3-8).

There are certain exceptions to this system. BR, PG and PH motors have only the voltage code number. In the BRS motor the "S" follows the voltage code number (for example BR-8S). Series 3 motors are written without voltage code number, but the top of the voltage range follows (Series 3-120).

The SS number shown on some motors is a factory identification number, and occasionally when writing to the factory regarding motors, it may be necessary to show the SS number.



Fig. 5. Motor Nameplate

## WHAT DO THE VOLTAGE CODE NUMBERS MEAN?

The rated voltage of family sewing machine motors is indicated by a dash (—) number suffixed to the catalog number, and values have been assigned to these dash numbers as follows (all voltages are DC and 25 to 75 cycles AC except where noted).

—3 for 32 volts DC only	—10 for 190-210 volts
—5 " 50 "	—11 " 210-230 "
—6 " 95-100 volts	—12 " 230-250 "
—7 " 100-110 "	—13 " (unassigned)
—8 " 110-120 "	—14 " 120-130 volts
—9 " 150-165 "	—15 " 130-145 "



## SERIES COMMUTATOR TYPE ELECTRICAL MOTOR

## DESCRIPTION

Family type sewing machines are almost always driven by series commutator type of electric motor. This motor consists of a stationary field which is housed in the outer frame of the motor, and carries within it an armature mounted on a shaft which rotates in bearings and provides the mechanical power output of the motor.

The field core is made up of a series of sheets of thin steel, especially compounded for its electrical properties, and stacked together to form what might appear on first glance to be a solid piece of steel of rather peculiar shape. This shape has been carefully designed to have the necessary characteristics to make a motor of proper performance. Within this field structure are found 2 coils of copper wire which carry the field current. These coils are carefully insulated so that none of the wires can touch the steel of the field structure.

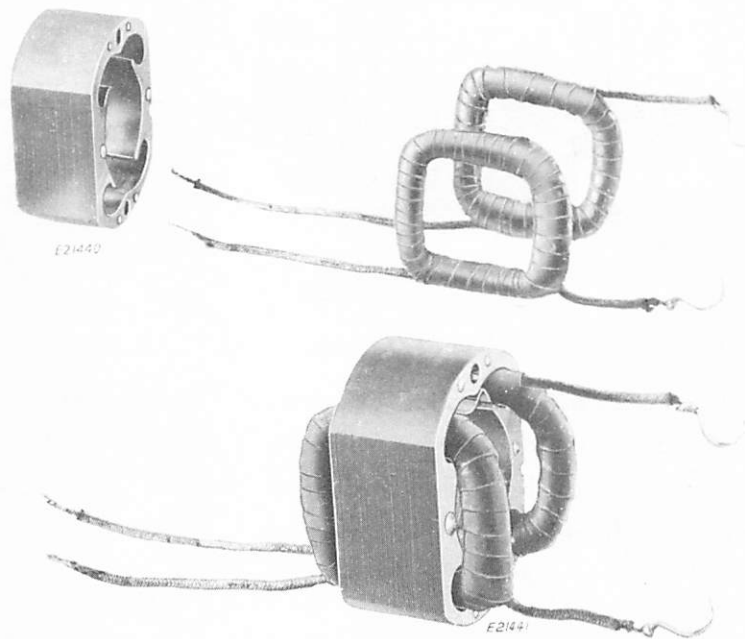


Fig. 1. Assembling Field Core and Coils of BA Motor

The armature core is likewise composed of a stack of thin electrical steel sheets, called laminations, designed for the job it must do. It usually has many slots into which coils of wire are wound. These coils are carefully insulated so that none of the individual wires will touch the steel of the

armature core. The wires from these coils on the armature are connected to a commutator, which is simply a series of copper bars arranged around the shaft. The armature shaft goes through the armature core, and rests in bearings held by the outer frame of the motor. The armature rotates in these bearings under the influence of the electric current and supplies mechanical power.

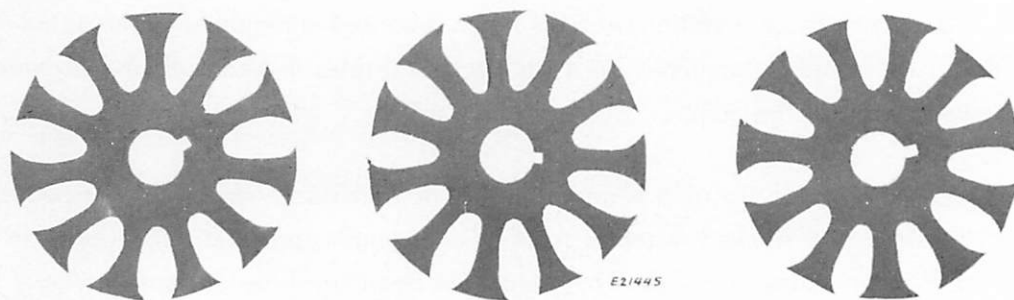


Fig. 2. Armature Laminations of BA3 Motor

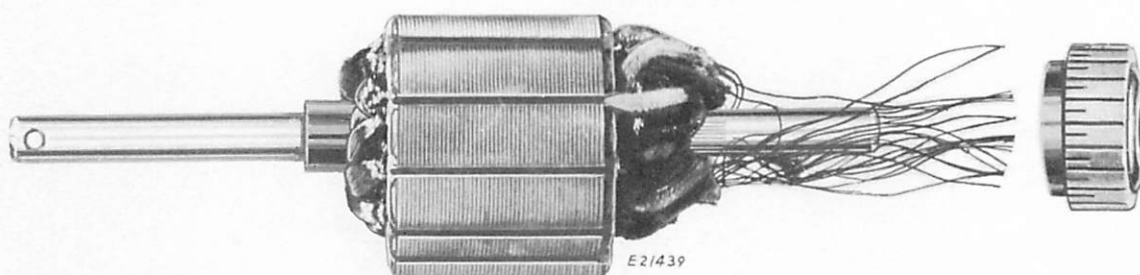


Fig. 3. Armature Core Wound

Commutator

The commutator is pressed on the shaft at one end of the armature winding. It is composed of copper bars separated from one another by sheets of mica insulation. Each armature coil is connected to different bars so that the commutator acts as a switch to successively change the coil connections as the armature revolves in the stationary field. For resume of the various types of family sewing machine motors see Part 2, Section 2.

The brushes are small blocks of electrically conductive carbon which are pressed by the brush springs against the bars of the commutator. These brushes are connected to the field windings in such a way that the current from the power supply flows through one field, then through the brushes



to the armature windings, then back through the brushes to the other field, and finally back to the power supply, giving up in the process the electrical energy which makes the motor run.

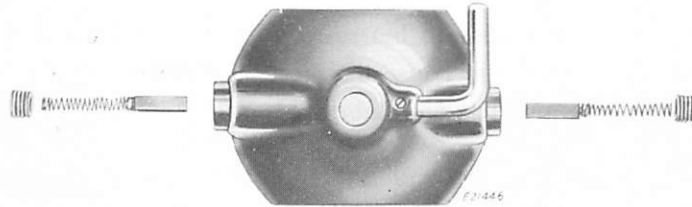


Fig. 4. Brushes, Brush Springs and Screws Removed from Motor

These electrical parts, although constructed and designed to give long and satisfactory service in the field, should not be abused. If the motor is taken apart for any reason, the electrical parts inside should be carefully handled to avoid damage.

Basically, all SINGER Family Sewing Motors are of this construction; that is, they consist of a stationary field winding, an armature winding, a commutator and brushes. Beyond this the housings for these parts and the electrical and mechanical connections of the motors vary with improvements and application.

There are two general groups of SINGER Family Sewing Motors. There are those motors that drive the sewing machine by means of a belt and pulleys and include the BT, BU, BR, BRS, BA, BS, BV, BY, BZ, Ser. 3, Ser. 4, CA6, CA7 and RF4 motors. The others drive the sewing machine through gears and include the SE, SU, PG, PH and PA motors.

### CAUTION

Always operate the motor within the voltage range stamped on the motor name plate. Where a single voltage is given on the name plate, instead of a voltage range, the motor will operate satisfactorily within about 10% on either side of the indicated voltage. A higher voltage supply will produce excess speed and may damage the motor. A lower voltage supply may not permit the motor to reach normal speed.

**CAUTION— Continued**

When operating a motor on alternating current, not only the available voltage, but the cycles should be within the range stamped on the name plate.

Orders for motors, controllers and sewing lights must specify the voltage range required.

Never apply oil or ordinary grease to the sewing machine motor. Use SINGER Motor Lubricant. Entrance of oil into the motor may cause the motor to "burn out". The motor lubricant should be applied, when necessary as instructed on page 24.

Brushes and springs should be removed and replaced as instructed on page 19. Customers should be cautioned against replacing them without proper instruction.

Caution all customers on the above matters and against "tinkering" with the motor at any time.

**MOTOR TROUBLES AND CAUSES**  
(See pages 5 and 6 for Remedies)

**MOTOR FAILS TO START**

Wrong connections at 3-pin terminal	Loose or broken connections
Current turned off	In field coil
Brushes not making contact	At brush tube
Controller pedal binding	In lead cord
Sewing machine binding	In wall plug
Armature binding; short-circuited; damaged	At 3-pin terminal
Motor lubricant heavy or gummed	
Commutator dirty	
Controller resistance unit broken or burned out	

**MOTOR SLOWS DOWN—FAILS TO REACH HIGH SPEED**

Voltage below that indicated on motor name-plate  
Lubricant heavy or gummed  
Pressure on presser foot too heavy  
Machine binding  
Armature binding  
Commutator is dirty or coated with oil or brushes are oil soaked

**MOTOR FAILS TO RESPOND EVENLY TO OPERATION OF CONTROLLER, THROUGHOUT SPEED RANGE**

Brushes not making contact  
Controller—carbon resistance unit—requires adjustment or replacement  
Controller pedal mechanism bent or broken



**MOTOR FAILS TO STOP**

Wrong connections at 3-pin terminal  
Short circuit  
Bell crank on pedal mechanism (controller) dislocated  
Carbon resistance unit (controller) requires adjustment

**MOTOR TOO HOT**

Lubricant heavy or gummed  
Voltage above that indicated on motor name plate  
Short circuit—loose electrical connections  
Machine binding  
Armature binding  
Too much dust accumulated in motor

**MOTOR NOISY**

Lubrication required—Do Not Use Oil  
Loose or hard brushes  
Motor not correctly seated on sewing machine  
Motor improperly assembled  
Core loose between end covers  
Excessive armature end play

**MOTOR TRANSMITS ELECTRICAL SHOCK**

Loose connections; frayed or broken wiring  
Interior of motor is coated with carbon

**REMEDIES FOR MOTOR DIFFICULTIES****1. Heavy or Gummed Lubricant—**

When machine has been idle for some time, the lubricant may become heavy, preventing machine from reaching normal speed. To overcome a slight reduction in speed due to heavy lubricant, run machine unthreaded for a few minutes with presser foot raised. If lubricant has become gummy in sewing machine mechanism flush off with Varsol, dry with a clean cloth and lubricate as described in instruction book for the particular machine. Motor should be cleaned, wicks checked and then lubricated with SINGER Motor Lubricant. An inferior lubricant may become gummy even after a short period of idleness.

**2. Electrical Current Not Turned On—**

Check power supply, switches, outlets and fuses.

**3. Loose or Broken Electrical Connections—**

Examine carefully all plugs and electrical connections in accordance with instructions on pages 7 to 9 inclusive. Make sure that there are no broken wires, and that all screwed or soldered connections are tight.

**4. Motor Not Suited for Electrical Supply—**

See that the voltage of the electrical supply, and the frequency, if it is alternating current, are within the range stamped on motor name-plate, as instructed under, "Cautions" on page 3.

**5. Dirty Commutator—**

Check commutator for traces of carbon or grease. Commutator can easily be cleaned as instructed on pages 22 and 23.

**6. Carbon Brushes Not Making Contact—**

When a brush does not make contact, it may be due to any of the following conditions:

- a. Grease or oil on contact surface of brush—Replace (see page 23).
- b. Dirt on brush—(Clean brush, brush tube and inside of end cover, as instructed on page 23).
- c. Damaged brush or brush tube—(Replace as instructed on page 24).
- d. Worn or broken brush springs—Replace (see page 24).

**7. Armature Binding—**

This condition, when it exists, can be discovered by turning motor pulley with the fingers, after belt is removed from pulley or gears are disengaged.

Causes of Armature binding:

- a. Motor end covers not correctly seated or secured, or motor end covers cracked.  
(See "Assembly of Motor", page 25).
- b. Lack of lubrication—The lubricant cups may be dry.  
(See "Lubrication", page 24).
- c. Brush tubes rubbing on commutator—this could occur if brush tubes are not correctly seated in bushing.  
(See "Brushes and Brush Tubes", page 24).
- d. Armature striking field coils.  
(See "Assembly of Motor", page 25).
- e. Fan blade rubbing against end cover or field coils.

**8. Broken Armature Wires—**

Check for breakage in fine wiring on end of armature.

(See "Armature", page 22).

**9. Controller Parts Bent, Broken or Not Correctly Adjusted—**

(See "Controller Instructions").

**10. Binding of Sewing Machine—**

(See Adjusters Manual for particular machine).

**11. Pressure for Presser Foot Too Heavy—**

(See Instruction book for particular machine).

**12. Dust Accumulation—**

(See "Maintenance of Motor", page 22).

**13. Motor Not Correctly Seated on sewing machine—**

(Check and replace motor, as instructed on pages 10 to 15).

**14. Motor Improperly Assembled—**

(See "Assembly of Motor", page 25).



**CONTROLLER LEADS**—For all Portable Machines equipped with foot controller—Fasten lead with **YELLOW** marker to connection sleeve No. 1, Fig. 11, on three-pin terminal plug. Fasten **SOLID BLACK** lead to connection sleeve No. 2, as shown in Fig. 11.

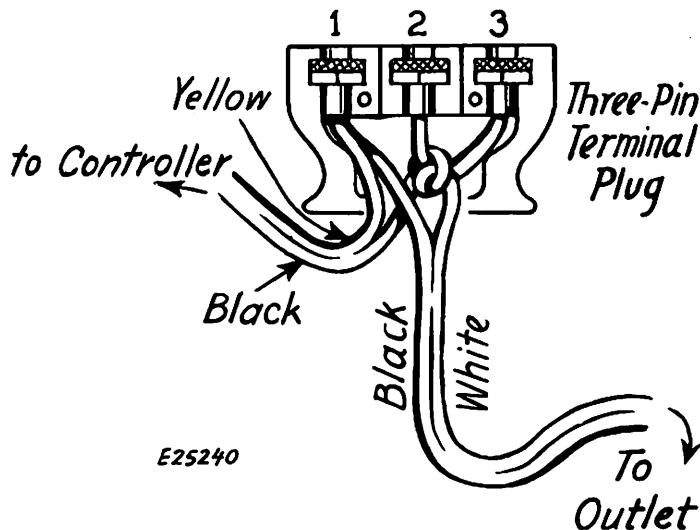


Fig. 11. Wiring Connections to Three-Pin Terminal Plug

**LINE LEADS (Electric Outlet Plug Leads)**—ALL MOTORS—Fasten **SOLID BLACK** lead to connection No. 1 of three-pin terminal plug and **WHITE** lead to connection No. 3 of terminal plug, as shown in Fig. 11.

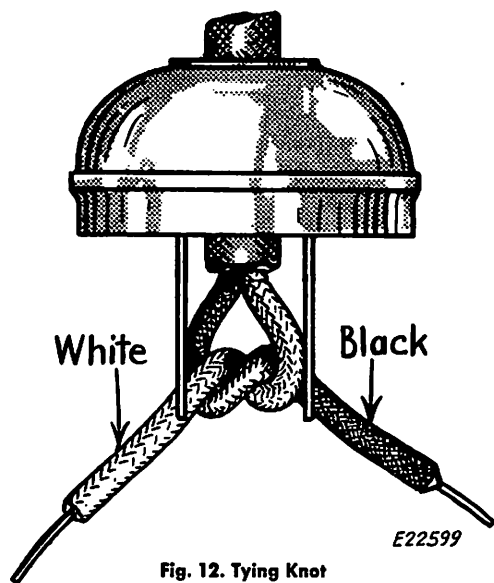


Fig. 12. Tying Knot (Outlet Plug)

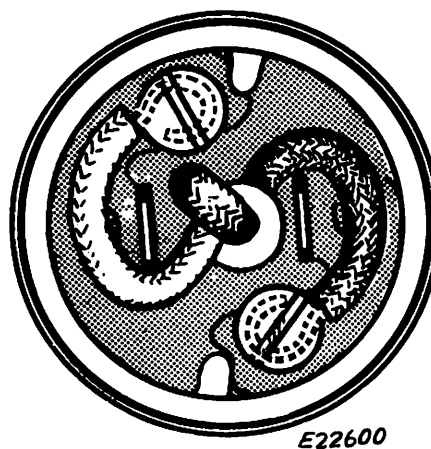


Fig. 13. Fastening Leads to Outlet Plug

The other end of each power line lead is connected to the outlet plug, as shown in Figs. 12 and 13. The two wires should be knotted together (see above) to prevent strain on connection when plug is incorrectly pulled from outlet by grasping wire instead of plug itself. The bare leads should be looped under the screw heads in the direction in which these screws are tightened, as shown in Fig. 13.

For modern electric outlet plug assembly see Part 7, Section 2, Page 5.

**NOTE:** Since BT, BS, BV, BZ, RF4, Ser. 4 and SE Motors do not use the 3-pin terminal system, the electrical connections are made as shown in Part 4.

## ASSEMBLY OF MOTOR TO MACHINE

## BT Motor

To assemble a BT Motor to the sewing machine attach motor to bracket by replacing screw, (Fig. 14).

Place motor belt on machine, start it upward over bottom of hand wheel, as shown in Fig. 14, until it touches underside of arm shaft extension, then continue up over top of hand

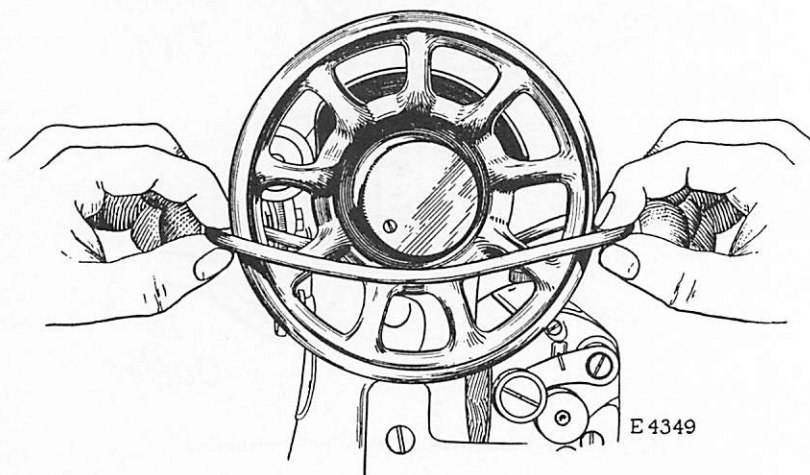


Fig. 14. Putting on the Belt

wheel. Never start the belt on over the top of the hand wheel, as the force necessary to do this will stretch the belt considerably.

Replace belt on motor pulley and put idler pulley on top of belt.

Attach plugs to foot and knee control.

Turn on current and test motor at each of its five different speeds. If motor does not start, remove belt from pulley and see if motor starts. Do not operate motor at full speed when disconnected from sewing machine. It will run much faster than intended, and is likely to damage armature windings or force top sticks out of slots in armature.

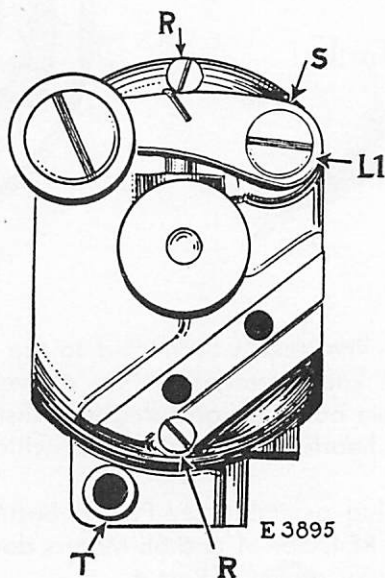


Fig. 15. Removing Idler Lever on BT Motor



**ADJUST IDLER**—If idler pulley does not press on belt with sufficient tension to take up slack in belt, more tension may be secured by removing screw L1 and idler lever S, Fig. 15 and moving the end of spring M1, Fig. 16 from hole 1 to hole 2. Further tension can be obtained by moving the spring to hole 3. Too much tension, however, will overload the motor, causing it to run slow and overheat.

If idler pulley, does not rotate freely, remove it, clean inside of bearing and scrape off black bearing level with face of pulley if necessary.

**NEVER OIL THE IDLER PULLEY BEARING.** It is made of material which does not require lubrication. Oil sometimes causes it to stick.

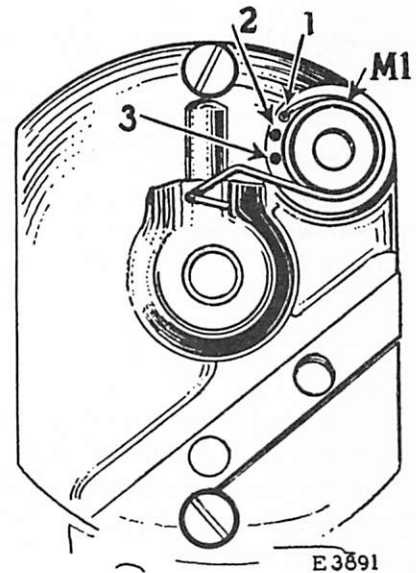


Fig. 16. Adjusting Tension on Idler Pulley of BT Motor

#### BU, BR, BRS, BA Motors

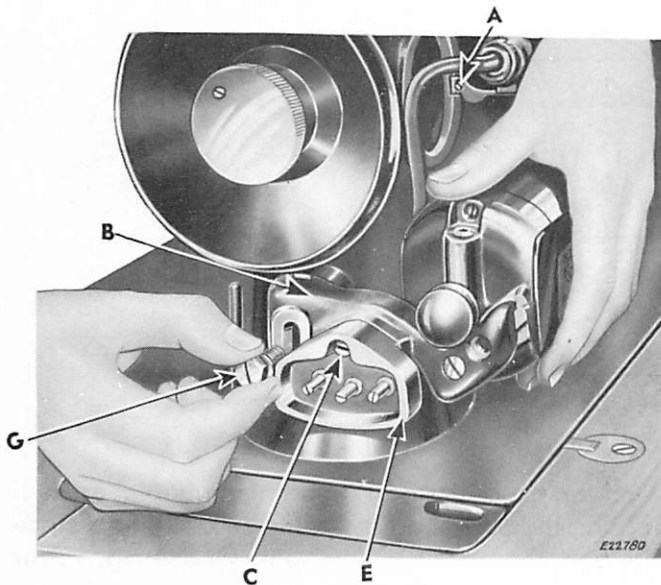


Fig. 17. Replacing BR Type Motor

To assemble a BU, BR, BRS or a BA Motor to a sewing machine clean motor bracket seat on machine in order to enable motor bracket to slide freely up and down when adjusting tension of belt.

Place motor bracket B, Fig. 17, with motor, on motor bracket seat of machine. Slide motor bracket upward as far as possible; replace and tighten screw G, Fig. 17.

While three-pin terminal block E, Fig. 17, is displaced after removing screw C, Fig. 17, connect electrical leads, as shown in Wiring Diagram, Part 4, Section 1, Page 4. Replace terminal block E and tighten screw C, Fig. 17.

Push terminal plug firmly over the three pins in terminal block E. Insert appliance plug on line lead into an electric outlet.

Adjust belt tensions as instructed on page 14.

### BS, BV, BY, BZ, Ser. 4, RF4 Motors

To assemble a BS, BV, BY, BZ, Ser. 4 or RF4 Motor on a sewing machine simply fasten motor bracket with motor to motor bracket seat on machine arm and adjust belt tension, as instructed on page 14.

### SE, SU MOTORS

To replace the motor, pass the two wires and insulating cable of the motor down inside of the arm and through the hole in the bed. (A piece of wire with a hook at one end may be inserted from below to draw the wires and cable down through the hole in the bed). While drawing the wires and cable through the hole in the bed, gently insert the motor into the machine, and turn it slightly from side to side until the spiral pinion meshes with the gear on the arm shaft and the motor will slip into position. Replace the screw A, Fig. 27, page 17 which fastens the motor frame in the machine, but do not tighten it.

Remove the three insulated thumb nuts on the three-pin terminal block and the three brass washers underneath them.

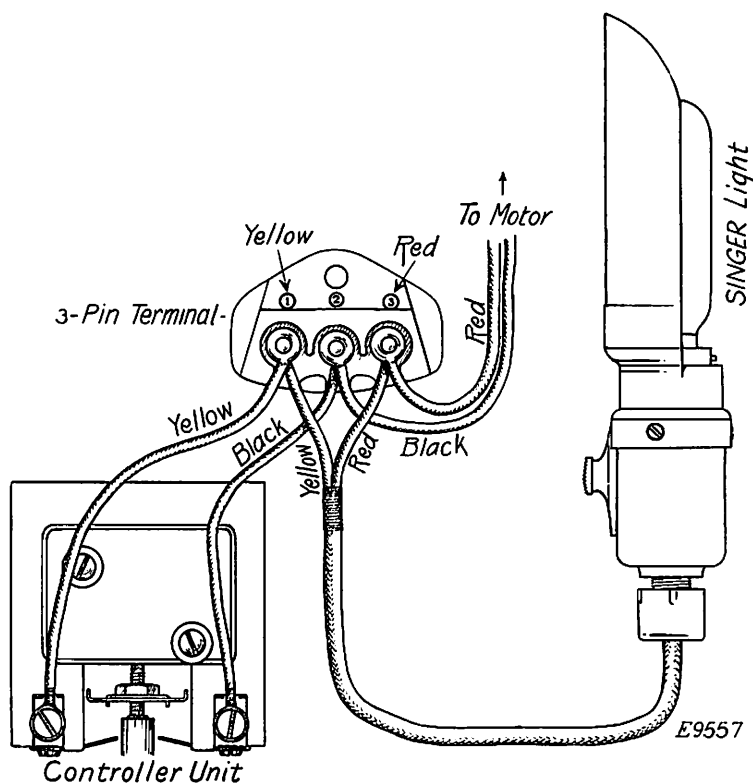


Fig. 18. Wiring Diagram for SU or SE Motors

Place the eyelets at the ends of the black leads on the centre post (2) of the three-pin terminal block; place the eyelets at the ends of the red leads on the post nearest the red spot (3), and place the eyelets at the ends of the yellow leads on the post nearest the yellow spot (1). See Fig. 18 for wiring diagram.

Replace the three brass washers and three insulated thumb nuts. Fasten the three-pin terminal block to underside of cabinet with screw.

With the knee lever held at full speed position, turn the motor frame slightly in each direction until the point where the speed is highest is reached, then firmly tighten the screw A, Fig. 27, page 17 thus fastening the motor frame securely in position. Then replace the motor cover and the screw in the front end of the armature shaft B, Fig. 27.



## PA Motor

To assemble a PA Motor in the sewing machine, turn the sewing machine on its side and holding the motor by the moulded cover enter the gear-end into the cylindrical hole in the post of the sewing machine. (See Fig. 23.)

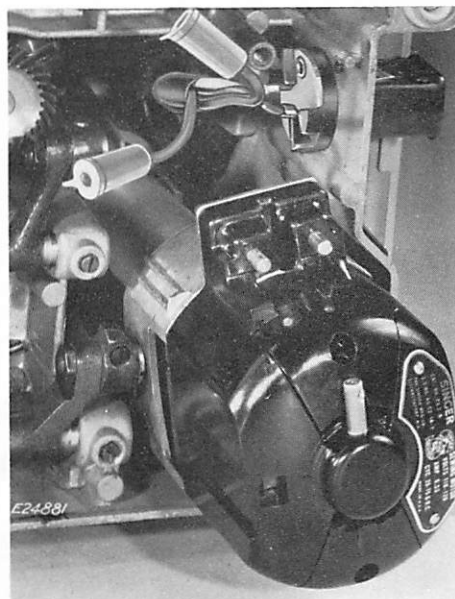


Fig. 23. Assembling  
PA Motor into Machine

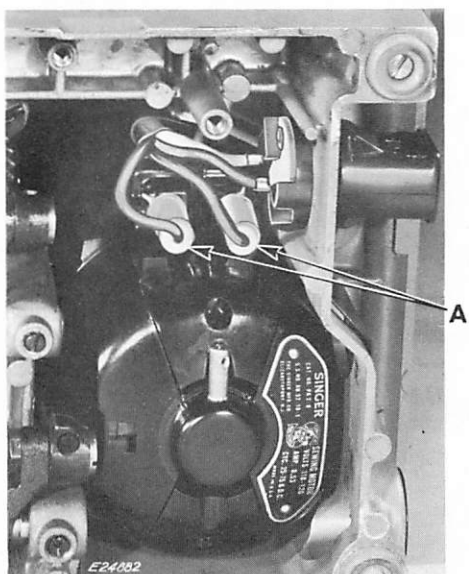


Fig. 24

Keep the motor terminals toward the front of the machine. Twist the motor slightly from side to side and push it into the machine until it bottoms. Connect the wiring harness to the two motor terminals, Fig.

24, and place the sheet metal clamp under the machine as shown in Fig. 25 with the bent portion of the clamp fitting between the terminals against the motor. Assemble screw A, Fig. 25, to hold clamp in place.

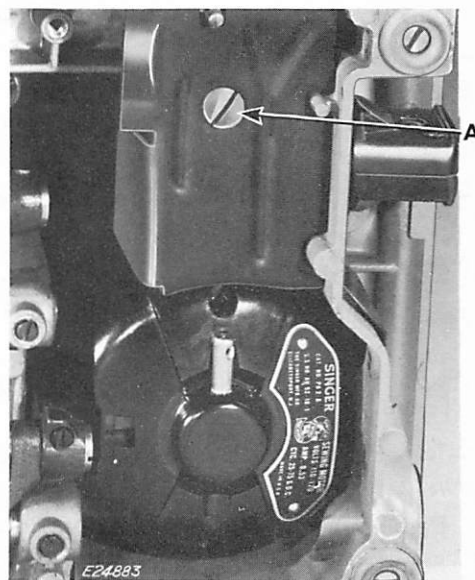


Fig. 25

## DISASSEMBLY OF MOTOR FROM MACHINE

## BT Motor

To remove a BT Motor from the sewing machine, reverse the procedure under "Assembly of Motor to Machine" page 10.

## BU, BR, BRS, BA Motors

The disassembly from the sewing machine of a BU, BR, BRS and a BA follows the procedure below:

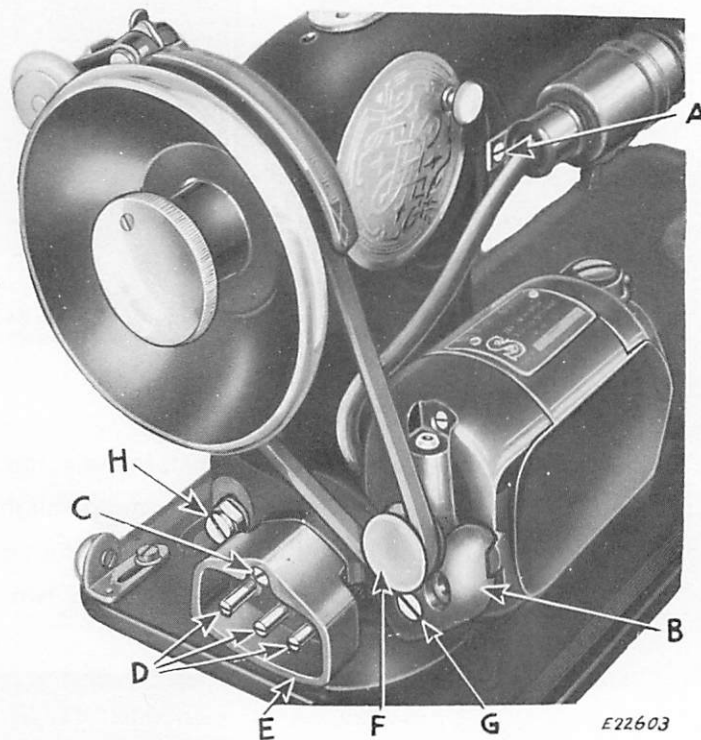


Fig. 26. Removing BR Type Motor from Machine

Remove screw C, Fig. 26, disengaging terminal block E, Fig. 26 from machine.

Disconnect motor leads from pins #2 and #3 on terminal block E, Fig. 26.

Remove screw G, Fig. 26, disengaging motor from motor bracket. Remove motor.

Remove belt from driving pulley F, Fig. 26.

## BS, BV, BY, BZ, Ser. 4, RF4 Motors

To remove a BS, BV, BY, BZ, Ser. 4 or RF4 Motor from the sewing machine follow the procedure below:

Remove screw A, Fig. 26, disengaging spotlight from arm of machine.

Remove screw H, Fig 26, disengaging motor bracket from bracket seat on machine and remove motor complete with motor bracket, controller and spotlight from machine.

Remove belt from driving pulley F, Fig. 26.

**PA Motor**

To remove a PA motor from a sewing machine follow the procedure below:

Remove bottom cover plate from machine.

Remove screw A, Fig. 25 from sheet metal clamp. Remove clamp.

Disconnect terminal plugs A, Fig. 24 from PA Motor terminals.

Twist the motor frame slightly from side to side and at the same time pull the motor out of the machine.

**DISASSEMBLY OF MOTOR**

In so far as the disassembly of these motors is concerned, the procedure is the same for the BT, BU, BR, BRS, BS, BV, BY, BA, BZ, PA, Ser. 3, CA6, CA7 and Ser. 4 Motors with very few exceptions. These will be noted when necessary, but otherwise follow the procedure listed below for disassembling the above listed motors. (Refer to the exploded views of Motors in Part 4 for location of parts mentioned in text below). Disassembly of other types of motors is listed and explained on pages 21 and 22.

**To Remove Bracket and Terminal Box Cover**

Remove bracket screw and take off motor bracket on BT, BU, BR and BRS Motors. Note that some motors, such as the BY and BZ, have the bracket and the terminal box cover made in one piece. On these motors remove the two terminal box screws.

On the BT and Series 4 Motors remove the two screws holding the terminal box cover to the bottom of the motor.

On the BS and BV Motors remove the four screws holding the terminal box and its cover to the bottom of the motor and disassemble from the leads. The brackets for the BS, BV and Series 4 are cast integrally with the pulley end cover.

The PA Motor has no bracket to mount it, but instead uses a separate sheet metal plate and a screw to hold it in the sewing machine.

**To Remove Brushes**

**CAUTION:** To insure that brushes are installed in same position in relation to commutator as they were in before removal, mark one side of each brush and the corresponding point on end of brush tube or motor with pencil or chalk during removal, as shown in Fig. 31.

Remove screw caps W, Fig. 31. If brush springs X do not protrude from screw holes when caps are removed, turn motor as required, so that first one and then the other of the two brush tubes is facing downward to permit brushes to be slipped out (see "CAUTION" concerning chalk marks, above). If brushes Y do not readily slip out of tubes, remove commutator-end cover, as instructed on page 21, and gently push brushes Y out from inside.



E22772

Fig. 31. Showing Brushes Removed

(Insert in Form 20596)



To remove the brushes on the BA, BZ and PA Motors it is necessary to remove the two brush cap screws and the two brush caps. Then gently pry out the two brush tubes taking care to prevent them from flying out because of the spring tension.

#### To Remove Pulley End Cover

Remove pulley screw from hub of motor pulley and slide pulley off armature shaft. Remove the two motor fastening screws and gently pull the cover from the motor.

**CAUTION:** Do not lose fibre washers on armature shaft. (See Exploded Views of Motors in PART 4).

**NOTE:** If there are motor leads passing through the pulley end cover it is not necessary to pull them through the cover in order to have access to this end of the motor. Merely draw cover towards end of leads.

The PA Motor is a gear-drive motor and has a different construction at this point. It is necessary, therefore, to remove the pulley-end cover to first remove shaft lock nut and pinion set screw to permit the removal of the pinion gear. Then remove the two pulley end housing screws and pull the cover from the motor. (Note that the armature remains in this cover because of the tight fit on the ball bearings. Do not attempt to remove it unless changing the bearing.)

After removing the pulley from the BY Motor it will be noted that there are no screws holding the motor together. Instead there are two snap rings at either end of the motor that must be removed. Set motor on end and place special pliers, Serial No. 189131 from Electrical Tool Set, Serial No. 187947, over hub at other end of motor, engaging ends of clamp ring with hooked jaws of pliers, see Fig. 32. When ends of ring are engaged, press down firmly on guard plates of pliers with thumb and first finger until ring is entirely enclosed by the jaws of the pliers, see Fig. 33. Squeeze pliers and lift clamp ring over hub. Remove clamp ring from other end of motor, see Fig. 34, and one of the halves of the motor can then be lifted off, leaving the motor exposed.



Fig. 32



Fig. 33

To replace clamp ring, hold pliers with guard plates on underside of jaws and slip end of ring into one hooked jaw of pliers. Gently press on other end of ring until it slips into the other hooked jaw. Being careful to squeeze pliers tightly before turning them over, place ring over hub and into position. Release ring and lift pliers off hub, see Fig. 35.



Fig. 34

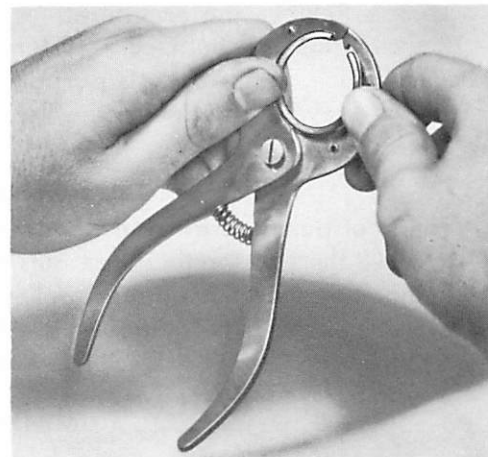


Fig. 35

#### To Remove Commutator End Cover

**CAUTION:** Unless the commutator-end cover is carefully removed, the electrical connections may be loosened or broken. These wires are sufficiently long to permit ready access to coils and to inside of cover when cover is removed only as far as length of lead will allow. On the BY, BA, BZ and PA motors there are no lead wires fastened to the commutator-end cover.

To remove commutator-end cover remove carbon brushes and the two motor fastening screws as instructed above. Then gently slide cover from armature shaft.

In the case of some BY Motors, a screw must be removed before the other cover-half can be removed.

#### To Remove Armature

To remove armature, displace brushes and end covers as instructed above. Grasp pulley-end of armature shaft and withdraw armature. If armature cannot be readily withdrawn from pulley-end, hold aside commutator-end cover and carefully withdraw from commutator end without straining soldered connections provided the armature has no fan blade on it. If armature cannot be readily withdrawn from either end, do not force its withdrawal. Inspect and clean it while it is in place.

#### Disassembly of SE and SU Family Sewing Motors

Remove the two grease cups to prevent the wicks being sheared off when replacing the armature in the motor frame.

The motor housing has two screws, one being in each side of the motor frame. Take out these two screws, being careful to see that the springs which are under the screws do not fly out, then turn the motor frame so that the springs and brushes will drop out of the screw holes. (See **CAUTION** under: "To Remove Brushes" above.)

Loosen the two set screws in the spiral pinion, and withdraw the armature from the motor frame, being careful not to damage the wiring of the armature or the surface of the commutator.

By removing the armature from the motor frame, the spiral pinion is separated from the armature shaft so that it can be lifted out of the recess between the two motor bearings.

### Disassembly of PG and PH Family Sewing Motors

Loosen the two screws, one of which is shown at G, Fig. 19, and remove motor cover F, Fig. 19 by pulling and, at the same time rocking it up and down slightly being careful to prevent inside of cover from damaging the field coils.

Take out brush screw caps. When screw caps are removed the brush springs may protrude from the screw holes and brushes can then easily be withdrawn. However, should difficulty be experienced, the brushes can be removed conveniently after removal of the armature. (See CAUTION under: "To Remove Brushes" above.)

Loosen the two set screws in the spiral gear so that the armature shaft can be withdrawn from its bearings. Remove the armature.

Remove the two field core fastening screws and remove the field core from the commutator end cover which, in this case, is part of the motor frame. The removal of the field core must be done carefully to prevent damage to the field coil insulation, and to prevent strain at the soldered brush tube connections.

### Disassembly of RF4 Family Sewing Motors

Take out pulley screw and remove pulley.

Remove the two terminal box nuts and disassemble terminal box.

Remove the two nuts against pulley end cover and take off pulley end cover.

Remove the two nuts against brush assembly and disassemble brush assembly and field core. Remove armature (see CAUTION under: "To Remove Brushes" above.)

## MAINTENANCE OF MOTOR

### General Cleaning

When the motor is sufficiently disassembled clean the interior surfaces, the armature, field coils and core. The accumulation of carbon dust on or near the armature and the electrical connections can cause damage to the motor and may cause an electric shock when motor is operating.

### Armature

Inspect enamel insulation on armature winding. Damaged insulation prevents efficient operation of motor. Inspect coil ends for broken or bared wires or for burned insulation. If wiring is damaged, install new armature.

### Commutator

When armature insulation and wiring are undamaged, inspect and clean the commutator as outlined below.

If the commutator is bronze or mahogany in color, and if the grooves between the bars are clean, the commutator does not need cleaning. Do not attempt to remove the chocolate-colored band of uniform color, as that band is a normal discoloration which does not indicate a dirty commutator.

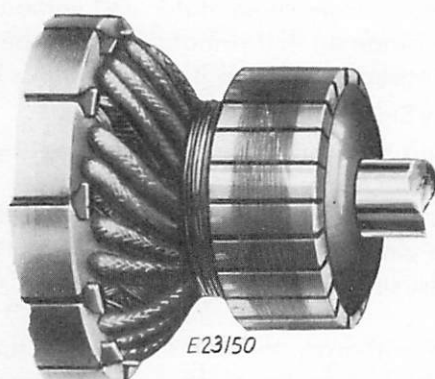


Fig. 36. Very Finely Marked Commutator—Will Give No Trouble

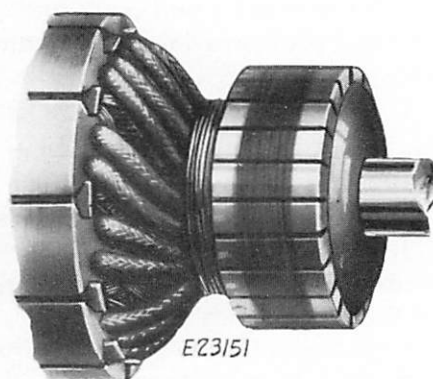


Fig. 37. Blackened Commutator—Needs Cleaning



When the commutator is blackened, or smudged with carbon or oil, it should be cleaned with a clean, dry cloth or a rubber eraser. **NEVER USE ANYTHING ELSE TO CLEAN A SMALL MOTOR COMMUTATOR.** A reliable test of the need for cleaning the commutator is when you are able to rub off any carbon or oil with your finger.

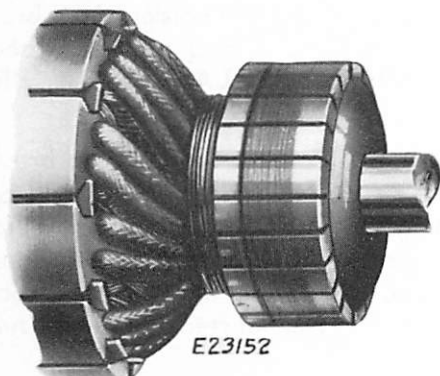


Fig. 38. Grooved Commutator—  
Must be Turned Down

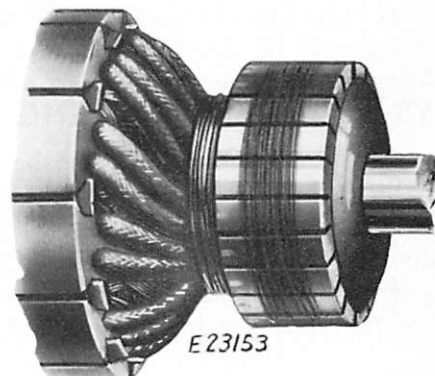


Fig. 39. Deeply Scratched  
Commutator—Must be Turned Down

If the commutator is scored or pitted, or if the carbon brushes have worn a groove in the commutator, it should be turned down.

If the grooves (slots) between the commutator bars are filled with dirt or carbon, they should be cleaned with a toothpick, orange stick or similar sharp piece of wood. (Do not use a tension screw driver, needle, or any metal object for this purpose.)

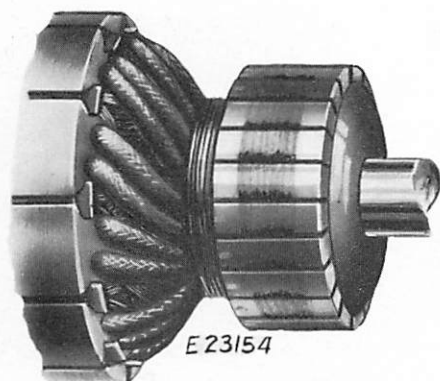


Fig. 40. Pitted Commutator—Must be Machined Out  
To Prevent Further Pitting

Excessive arcing from one brush to the other indicates that the commutator is rough, one of the brushes is stuck in the brush tube, or one or more armature coils are short-circuited. The commutator and brush tubes should be first cleaned, and armature retested with new carbon brushes. If arcing persists install a new armature.

A badly blackened or smudged commutator usually results from oil-soaked brushes. In such cases, the entire motor should be cleaned and new carbon brushes and springs installed. **NEVER USE AN OIL-SOAKED BRUSH.** If the brush does not slide freely, clean the brush tube and be sure that the bottom of the tube is not burred. It is better to rub a new brush on a newspaper to remove some of the roughness than to rub it on coarse sandpaper.

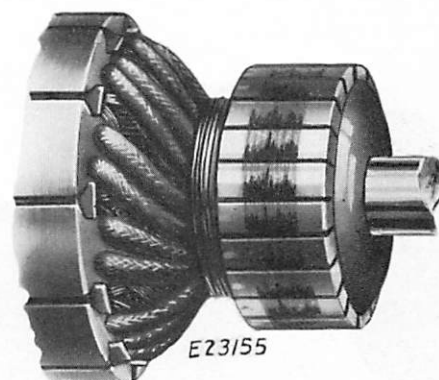


Fig. 41. Badly Pitted Commutator—Check Armature  
For Short-Circuits, Must be Machined Out

## CAUTION

**DO NOT USE ALCOHOL OR ANY OTHER STRONG SOLVENT WHEN CLEANING A COMMUTATOR OR ARMATURE. WIPE MOTOR CLEAN WITH CLOTH DAMPENED SLIGHTLY IN VARSOL AND WIPE WITH A CLEAN CLOTH.**

## Brushes and Brush Tubes

Examine both wire connections to brush tubes. Wires must be firmly soldered to lugs. Loose strands of wire should be cut off to avoid grounding or short circuiting.

Brushes should be replaced when they are worn below 1/4" in length. Brushes that have become oil soaked, stuck in the holder or too loose in the holder, should also be replaced. Replacement brushes should be checked to see that they have a free sliding fit in the holder, but a brush that is too loose should be discarded since it may vibrate and cause noise and arcing. Brushes that squeak when motor is running should also be replaced. **WHEN REPLACING A BRUSH, ALWAYS REPLACE THE SPRING WITH IT.**

Damaged brush tubes must also be replaced by new tubes. To remove damaged brush tubes on BZ, BA or PA motors, slide brush tube out. On BU, BT, BV, BS, PG, PH, Series 3 and Series 4 motors, it is necessary to loosen the small set screw holding the brush insulation tube before the brush tube assembly can be removed. On the RF4, it is necessary to replace the whole brush tube assembly if the brush tubes are damaged. When replacing, make sure that the new tubes are installed in the correct position and that the field leads are firmly connected to the new tubes.

## Lubrication

Never apply oil or ordinary grease to the sewing machine motor. Use only SINGER MOTOR LUBRICANT. Entrance of oil into the motor may cause the motor to "burn out". Do not over lubricate and do not lubricate too frequently; too much is worse than not enough. Excess lubricant will escape from the bearings and reach the brushes and commutator where it interrupts electrical contact.

When the machine is shipped from the factory, the two grease tubes are filled with enough lubricant for approximately six months' use.

When the machine is used constantly, refill grease tubes D, Fig. 42, at least once each six months by inserting tip of lubricant container into grease tubes and squeezing sufficient lubricant into each tube to fill it.

If a motor has become oil soaked due to incorrect lubrication, it should be thoroughly wiped both inside and outside including the windings, with a cloth dampened in fresh Varsol. After wiping, the parts should be set aside in a well ventilated room until thoroughly dry.



Fig. 42. Motor Lubricating Points

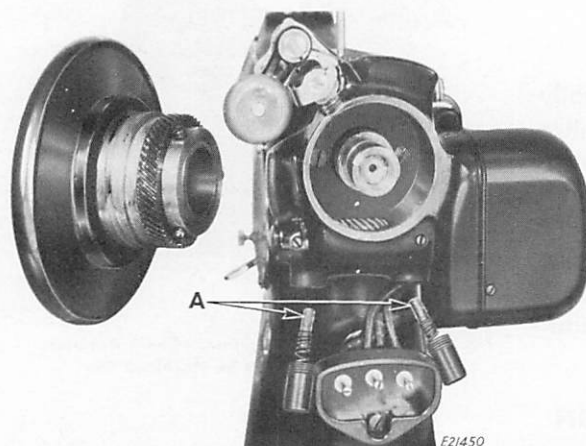


Fig. 43. Showing Lubricating Wicks of PG Motor

On some motor designs the lubricating wick, A, Fig. 43, goes through the bearing and rests on the shaft. Care should be taken in reassembling motors of this type to push back the wick before inserting the shaft in the bearing. Other motor designs use porous metal bearings which permit lubricant to seep through the metal itself, making it unnecessary to have the wick touch the shaft. When servicing a motor, lubricating wicks that have become hardened should be replaced.

On some gear type motors such as the SU, SE, PG and PH motors it is necessary to grease the gears. First clean off the old grease from the gears and adjoining areas with Varsol, then apply one

teaspoonful of grease to the motor gear. An excess of grease on the gears will cause the grease to seep into the motor and prevent it from running properly.

### Testing

After servicing a motor, the armature should be checked to see that it turns freely and that it has sufficient end play to allow a small axial movement. The motor should be run on the bench through a controller at reduced speed to check its operation. Never run a motor no-load on full voltage for more than a very short time. Prolonged running at high speed will seldom correct a stiff motor and may damage it. If resetting of end covers does not correct the cause of the bind, dismantle and carefully reassemble, checking freeness during each step of assembly.

### Assembly of Motor

To assemble any of the family sewing motors reverse the procedure outlined for their disassembling, noting the special points listed below on certain types of motors. Reference to the Exploded Views in PART 4 will be helpful.

BT, SE Motors—Be sure that the head of screw 50520 is in firm contact with the jumper plate on terminal 190651 and in the hole corresponding to the current available.

BR, BS, BV and Ser. 4 Motors—When it is necessary to replace either of the end covers on these motors, both end covers should be ordered from the factory to replace the old covers. These end covers are reamed together to insure perfect alignment so that they will not bind the armature when the end cover screws are tightened.

All Motors except BA, BY, BZ, PA and RF—When the armature is removed the spring pressured grease wick for each bearing projects into the shaft bearing. Therefore, before replacing the armature and shaft hold back the wicks with a screwdriver or some other instrument until the shaft is through the bearing to prevent any damage to the wicks.

BA, BZ and PA Motors—When reassembling covers to motor be sure field core wedge is correctly seated on the core so that the line forming the peak of the wedge is parallel to the mating edge of the end covers. See Fig. 43 A.

In any motor assembly note the following points:

Make sure that wires from field coils to brush tubes are positioned to avoid pinching or contact with armature or commutator.

To prevent end play, make sure that the correct washers are on both ends of armature shaft. Look through brush tubes to check if washers are on correct end of armature. Center of commutator should be directly under brush tubes.

Position leads so that they do not touch armature. Make sure end covers are correctly seated, then insert and tighten motor bolts.

NOTE: End covers must fit firmly over motor to insure perfect alignment of armature shaft bearings.

Turn armature shaft by hand, checking freedom of movement.



Fig. 43A. Showing Field Core Wedge Correctly Seated



## SEWING MACHINE MOTOR APPLICATION CHART

MACHINE NO.	BONNIERES	CAMPINAS	CLYDEBANK	FRANKFURT	MONZA	ST. JOHNS	U.S.A.	MOTOR	LIGHT
<b>Class 306 Machine</b>									
306-11					x			BA4	S4
306-13					x			BA4	S4
306-15					x			BA4	S4
306-17					x			BA4	SLF3
306-23			x					BA4	S4
306-25						*	x	BA3	S4
306-25			x			*		BA4	S4
306-26							x	BA5	S4
<b>Class 316 Machine</b>									
316-2				x				BA8	Spotlight
316-4				x				BA8	Spotlight
<b>Class 319 Machine</b>									
319-2							x	BA3	S4
319-2			x		x			BA4	S4
319-3							x	BA5	S4
319-12					x			BA4	S4
<b>Class 1200 Machine</b>									
1200-1							x	PH	193930

(1) For Voltages Below 150 Only

\* Machine Imported

\*\* Machine and Motor Imported

**ACTIVE ELECTRIC SETS IN WHICH MACHINES CLASSES 15, 66,  
127, 191, 201, 206, 301, 306 AND 319 ARE USED**

SET NO.	AVAILABLE FROM							CONTROLLER	MACHINES USED IN CABINETS									DESCRIPTION
	BONNIERES	CAMPINAS	CLYDEBANK	FRANKFURT	MONZA	ST. JOHNS	U.S.A.		CLASS 15	CLASS 66	CLASS 127	CLASS 191	CLASS 201	CLASS 206	CLASS 301	CLASS 306	CLASS 319	
40			x		x	x	x	Foot and Knee	x	x		x	x	x	x	x	x	Electric Cabinet
56							x	Foot and Knee	x	x		x	x	x	x	x	x	Electric Cabinet
65		x						Foot and Knee	x	x		x	x	x	x	x	x	Electric Desk Cabinet
71		x						Foot	x	x		x	x	x	x	x	x	Electric Cabinet
74							x	Foot and Knee	x	x		x	x	x	x	x	x	Electric Cabinet
75			x		x			Foot	x			x	x	x		x	x	Electric Cabinet
76						x	x	Foot and Knee	x	x		x	x	x	x	x	x	Electric Cabinet
77						x	x	Foot and Knee	x	x			x	x	x	x	x	Electric Cabinet
86							x	Foot and Knee	x	x			x	x	x	x	x	Electric Cabinet
87							x	Foot and Knee	x	x			x	x	x	x	x	Electric Cabinet
194	x		x			x		Foot	x	x	x	x	x					Portable Bent Cover
208						x	x	Foot	x	x	x	x						Portable Base & Cover
218			x					Knee						x		x	x	Portable Bent Cover
219			x			x		Foot						x		x	x	Portable Bent Cover
250			x					Knee	x	x		x	x					Portable Bent Cover
254	x		x					Foot	x	x	x	x	x					Portable Bent Cover
263	x		x		x			Foot	x			x	x					Carrying Case
264			x		x			Knee	x	x		x	x					Carrying Case
265						x	x	Foot						x		x	x	Carrying Case
266						x	x	Foot	x	x	x	x	x					Carrying Case
267			x					Foot						x		x	x	Carrying Case
268			x					Knee						x		x	x	Carrying Case
269						x	x	Foot							x			Carrying Case
314							x	Foot							x			Utility Table
401						x	x	Foot and Knee	x	x	x	x	x	x	x	x	x	Student Set
402						x	x	Foot and Knee	x	x	x	x	x	x	x	x	x	Student Set
408							x	Foot and Knee	x	x	x	x	x	x	x	x	x	Student Set
417							x	Knee	x	x		x	x		x	x	x	School Table
418							x	Knee	x	x		x	x		x	x	x	School Table
419							x	Knee	x	x		x	x		x	x	x	School Table

**ACTIVE NON-ELECTRIC SETS IN WHICH MACHINES CLASSES 15,  
66, 127, 191, 201, 206, 306 AND 319 ARE USED**

SET NO.	AVAILABLE FROM							MACHINES USED IN CABINETS								DESCRIPTION
	BONNIERES	CAMPINAS	CLYDEBANK	FRANKFURT	MONZA	ST. JOHNS	U.S.A.	CLASS 15	CLASS 66	CLASS 127	CLASS 191	CLASS 201	CLASS 206	CLASS 306	CLASS 319	
1			x					x	x	x	x	x	x	x	x	Cabinet Table
6			x			x	x	x	x	x	x	x	x	x	x	Cabinet Table
7			x			x	x	x	x	x	x	x	x	x	x	Cabinet Table
34	x		x		x			x	x	x	x					Plain Table
51			x					x	x	x	x	x	x	x	x	Enclosed Cabinet
53					x			x	x	x	x	x				Semi-Enclosed Cabinet
54					x			x	x	x	x	x				Semi-Enclosed Cabinet
55	x		x					x	x	x	x					Plain Table with Bent Cover
80	x		x		x			x	x	x	x	x				Leaf Table
92	x		x		x			x	x	x	x	x				Leaf Table with Bent Cover
151					x			x								Enclosed Cabinet
233	x		x	x	x	x		x	x		x	x	x	x	x	Detachable Leaf Cabinet
235	x		x			x		x	x		x	x	x	x	x	Detachable Leaf Table
237			x	x		x		x	x		x	x	x	x	x	Detachable Leaf Table
238			x					x	x		x	x	x	x	x	Semi-Enclosed Cabinet
239			x	x	x	x		x	x		x	x	x	x	x	Detachable Leaf Table
351					x			x								Enclosed Cabinet
404		x	x			x	x	x	x	x	x	x	x	x	x	Cabinet Table
405			x			x	x	x	x	x	x	x	x	x	x	Cabinet Table
406			x			x		x	x	x	x	x	x	x	x	Cabinet Table
407			x			x	x	x	x	x	x	x	x	x	x	Cabinet Table
461					x			x								Enclosed Cabinet
BF110	x							x	x			x	x	x		
BF111	x							x	x			x	x	x		
BF112	x							x	x			x	x	x		
BF120	x							x	x			x	x	x		
BF121	x							x	x			x	x	x		
BF122	x							x	x			x	x	x		

**ACTIVE ELECTRIC SETS IN WHICH MACHINES CLASSES 99, 128,  
215, 216, 221, 222 AND 1200 ARE USED**

SET NO.	AVAILABLE FROM							CONTROLLER	MACHINES USED IN CABINETS								DESCRIPTION
	BONNIERES	CAMPINAS	CLYDEBANK	FRANKFURT	MONZA	ST. JOHNS	U.S.A.		CLASS 99	CLASS 128	CLASS 215	CLASS 216	CLASS 316	CLASS 221	CLASS 222	CLASS 1200	
73			x			x	x	Foot	x	x							Electric Cabinet
134							x	Foot								x	Electric Cabinet
195			x				x	Foot	x								Portable Bent Cover
198			x			x	x	Foot		x							Portable Bent Cover
207			x					Foot		x							Portable Square Case
209						x	x	Foot	x								Portable Base & Cover
210			x					Foot		x							Portable Square Case
251			x					Knee	x								Portable Bent Cover
262			x					Knee	x								Carrying Case
270						x	x	Foot						x			Carrying Case
271			x					Foot						x	x		Carrying Case
312						x	x	Foot						x			Utility Table
SF135				x				Foot			x	x	x				Carrying Case
SF286				x				Foot			x	x	x				Electric Cabinet



**ACTIVE NON-ELECTRIC SETS IN WHICH MACHINES CLASSES 99,  
128, 215 AND 216 ARE USED**

SET NO.	AVAILABLE FROM							MACHINES USED IN CABINETS					DESCRIPTION
	BONNIERES	CAMPINAS	CLYDEBANK	FRANKFURT	MONZA	ST. JOHNS	U.S.A.	CLASS 99	CLASS 128	CLASS 215	CLASS 216	CLASS 316	
12			x						x				Cabinet Table
45	x		x					x	x				Plain Table
BF110V	x								x				Enclosed Cabinet
BF111V	x								x				Enclosed Cabinet
BF112V	x								x				Enclosed Cabinet
BF120V	x								x				Enclosed Cabinet
BF121V	x								x				Enclosed Cabinet
BF122V	x								x				Enclosed Cabinet
236	x		x						x				Detachable Leaf Table
255			x						x				Portable Bent Cover
256			x					x					Portable Bent Cover
260			x					x					Carrying Case
261			x						x				Carrying Case
SF55 (1)				x						x	x	x	Enclosed Cabinet
SF86				x						x	x	x	Semi-Enclosed Cabinet
SF88				x						x	x	x	Semi-Enclosed Cabinet
SF115				x						x	x	x	Cabinet
SF125				x						x	x	x	Cabinet
SF225				x						x	x	x	Enclosed Cabinet
233	x		x	x	x	x				x	x	x	Detached Leaf Table
237			x	x		x				x	x	x	Detached Leaf Table
239			x	x	x	x				x	x	x	Detached Leaf Table

(1) This cabinet available in different woods under Nos. SF61, SF66, SF68, SF104, SF106, SF120, SF121 and SF124.

# INACTIVE ELECTRIC SETS IN WHICH MACHINES HAVE BEEN USED

SET NO.	CONTROLLER	CLASS 15	CLASS 66	CLASS 99	CLASS 127	CLASS 128	CLASS 201	CLASS 206	CLASS 221	CLASS 222	CLASS 301	CLASS 306	CLASS 1200	DESCRIPTION
41	Foot and Knee		x											Electric Cabinet
42	Foot and Knee	x					x	x			x	x		Electric Desk Cabinet
43	Foot and Knee	x					x	x			x	x		Electric Desk Cabinet
47	Foot and Knee	x	x				x							Electric Cabinet
48	Foot and Knee	x					x							Electric Cabinet
49	Foot			x		x								Electric Cabinet
50	Foot and Knee	x	x		x		x							Electric Cabinet
64	Foot and Knee					x								Electric Cabinet
67	Foot and Knee	x	x		x									Electric Cabinet
68	Foot								x					Electric Cabinet
72	Foot	x	x		x									Electric Cabinet
132	Treadle												x	Leaf Table
200	Knee					x								Portable Bent Cover
201	Knee			x										Portable Bent Cover
212	Knee	x	x		x		x	x				x		Portable Bent Cover
217	Foot							x				x		Portable Base
301	Foot and Knee			x		x								Electric Combination Table
302	Foot and Knee	x	x		x									Electric Plain Table
303	Foot	x	x		x		x							Electric Combination Table
305	Knee	x	x		x									Electric Cabinet Table, Flat Top
306	Knee	x	x		x									Electric Cabinet Table, Flat Top
308	Foot								x					Utility Table
311	Foot			x										Utility Table
313	Foot			x		x								Utility Table
316	Foot							x				x		Portable Set
403	Treadle	x	x		x		x							Electric Cabinet Table
409	Knee	x	x				x							School Table
410	Knee										x			School Table
411	Knee	x	x				x	x				x		School Table
412	Knee	x	x				x	x				x		School Table
413	Knee	x	x				x	x				x		School Table
414	Knee										x			School Table
415	Knee										x			School Table
416	Knee										x			School Table

# MANUAL OF ELECTRICAL INSTRUCTIONS

## PART 2 Section 1, Page 9

### INACTIVE NON-ELECTRIC SETS IN WHICH MACHINES HAVE BEEN USED

SET NO.	CLASS 15	CLASS 66	CLASS 99	CLASS 127	CLASS 128	CLASS 201	DESCRIPTION
2	x	x		x		x	Cabinet Table
3	x	x		x		x	Cabinet Table
4	x	x		x		x	Cabinet Table
5	x	x		x		x	Cabinet Table
13					x		Cabinet Table
14					x		Cabinet Table
23	x	x		x			Drawing Room Cabinet
24	x	x		x			Drawing Room Cabinet
31	x	x		x			Drawing Room Cabinet
32	x	x		x			Drawing Room Cabinet
46	x	x		x			Enclosed Cabinet
79	x	x		x		x	Leaf Table with Square Cover
96	x	x		x		x	Leaf Table with Square Cover
121	x	x		x		x	Leaf Table with Square Cover
122			x		x		Leaf Table with Square Cover
123	x	x		x		x	Leaf Table with Square Cover
124			x		x		Leaf Table with Square Cover
142	x	x		x		x	Leaf Table with Square Cover
143			x		x		Leaf Table with Square Cover

BELT APPLICATION CHART

MOTOR CAT. NO.	HAND WHEELS 15282*, 54563 AND 125473. 54563 USED ON 127 AND 128 MACHINES ONLY.					HAND WHEELS 32672 AND 105072				HAND WHEEL 56136 206K1 TO 206K19	24-68 AND 24-69	24-80	142W	221 AND 222
	15	66,127 AND 201	99 AND 128	206K1 TO 206K19	206K20 AND UP, 306	15, 66 AND 201	99	206K20 AND UP, 306						
BA3, BA5	193066	193066	193066		196388	196386	198651	198651						
BA4	**	196388	196389		196388	196386	196387	198651						
BR, BR-S	193066	193066	193066	196389	196388	193077	193077	198651	196388					
BR2, BR2-S	196388	196388	196388			196386	198651							
BR-20												194144		
BS			193066											
BT	193499	193499	193499											
BU, BUE	193066	193066	193066			193077	193077	193077		193755	193822			
BV		193066				193077								
BY	193066	193066	193066			193077	198651							
BZ	196388	196388	196389			196386	198651							
CA6, CA7													194144	
MT, MUI												194144		
RF	196388	196388				196386	198651							
SER3														194144
SER4		193066	193066			193077								

\* Electric Drive not recommended with Hand Wheel No. 15282 as Motor will overheat with sustained operation.

\*\* For BA4 and BZ Motors use Belt No. 196389 in Cabinets Nos. 233, 235, 237, 239 and 240 and Belt No. 196388 in all other Cabinets.



**RESUME OF FAMILY TYPE SEWING MOTORS**

**B.T. FAMILY SEWING MOTORS** (Obsolete, superseded by BU Motors) were designed for use on Machines of Classes 15, 66, 24, 115, 127, and 128 and Machine 99K1. This type of motor is housed in two cast iron end covers and has a sheet steel shield over the field core. A terminal cover underneath the motor hides a terminal board used to change from A.C. to D.C. This method of conversion was still necessary at the time that the BT was built. A cast iron bracket supplied the means for mounting the motor and a steel pulley with a fabric belt was furnished to drive the sewing machine.

Connections were made in a connector block to the controller and line plug. A SINGER light can be furnished if desired.

**B.U. FAMILY SEWING MOTORS** (Obsolete, superseded by BR Motors) were designed for use on Machines of Classes 15, 24, 66, 99, 115, 127 and 128. Basically, this motor is similar to the B.T. except for several added improvements.

This motor is universal; there is no need to change any connections when switching from A.C. to D.C.

This bracket was redesigned to mount a 3-pin terminal to which the leads from the motor, controller, and SINGER light are connected. The line lead is fitted with a special plug that connects to the 3-pin terminal.

**B.R. FAMILY SEWING MOTORS** (Obsolete, superseded by BRS Motors), designed for use with Machines of Classes 15, 66, 99, 115, 127 and 128, include molded housings and core shield, and an internal cooling fan. They are furnished with a metal bracket which carries a 3-pin terminal block of molded composition.

The controller, furnished with the motor, includes the 3-pin terminal plug with a lead to the controller and a lead to the appliance plug for the electric outlet.

A SINGER light, furnished upon specific order, can be connected to the 3-pin terminal when desired.

**B.R.-S FAMILY SEWING MOTORS** (Obsolete, superseded by BA Motors), designed for use with Machines of Classes 15, 66, 99, 127, 128 and 201, are similar to the B.R. Motor except that the length of the field core had been shortened to 1-1/8 inches and the end covers altered slightly in design.

**BA3 FAMILY SEWING MOTORS**, designed for use with Machines of Classes 15, 66, 99, 127, 128, 201, 206 and 306, are similar with the following exceptions to the B.R.-S Motors.

A terminal box, built into the bottom of the motor, houses the connections for the motor leads and for the electrical power leads from the 3-pin terminal.

The motor bracket which carries the 3-pin terminal block fastens to the side of the terminal box under the motor.

**BA4 FAMILY SEWING MOTORS** are similar to the BA3 Motors except that the three-pin terminal and wiring are enclosed within the mounting bracket and a radio and television interference suppressor is built into the motor. The BA4 Motor is used interchangeably with the BA3 except on treadle stands in applications where it is desired to operate by both motor and treadle power.

**BA5 FAMILY SEWING MOTORS** are the same as the BA3 Motors except for added provisions to ground the motor and machine. They are used with the same machines as the BA3 and are intended primarily for use in school tables.

**SERIES 3 FAMILY SEWING MOTORS**, designed for use with Machine 221-1 only, have cast aluminum end covers and a combination metal core shield and name plate.

They are furnished with a metal pulley for belt driving the sewing machine.

These motors give the appearance of having been built into the sewing machine. The electrical connections are made to a 3-pin terminal block in the base of the machine. The controller, furnished with the machine, includes the 3-pin terminal plug and is similar to that used with the B.R. type motor.

The sewing light is not furnished with these motors, as the light assembly is built into the head of Machine 221-1.

The Series 3 Motors are used interchangeably with the CA6 and CA7 Motors on voltages below 150 volts. They are not used on voltages of 150 volts or greater now but had been in the past.

**CA6 FAMILY SEWING MOTORS**, designed for use with Machines of Classes 221 and 222, are similar to the Series 3 Motor with which they are used interchangeably, as explained above, except that they are completely insulated by two molded composition end covers and a molded composition pulley. The combination metal core shield and name plate is insulated from the field core by a strip of insulation paper.

The grease tubes are of a slightly different design and there are differences in the internal wiring, but these do not create any repair problems.

**CA7 FAMILY SEWING MOTORS**, designed for use with Machines of Classes 221 and 222, are the same as the CA6 Motors except they have a cooling fan on the armature and slightly different pulley end covers. It also has a built-in radio and television suppressor.

**SERIES 4 FAMILY SEWING MOTORS** (Obsolete, superseded by the BS and BV Motors), designed for the 66-8 and 128-8 Sewing Machines, are similar to the Series 3 motors except that each end cover is cast with a fin at the bottom that becomes one end of a terminal box once the terminal box cover is placed over the fins. In this terminal box all connections from the lead wires of the motor to the leads of the controller, the spotlight and the appliance plug are made.

The mounting bracket is cast integrally with the pulley-end cover.

These motors are furnished with a metal pulley for belt-driving the machine.

**B.S. FAMILY SEWING MOTORS** (Obsolete, superseded by the BY Motors) were designed for Class 128-8 Machines. These motors have end covers made of Zinc Zamac, a core shield made of sheet steel and no internal cooling fan. The mounting bracket is cast integrally with the pulley end cover.

These motors do not employ the 3-pin terminal. Instead, the lead wires for the motor, controller and spotlight and the lead wire to the appliance plug for the electric outlet are all connected in a terminal box fastened to the bottom of the motor. The terminal box is provided with built-in strain reliefs.

These motors are furnished with a metal pulley for belt driving the sewing machine.

**BV FAMILY SEWING MOTORS** (Obsolete, superseded by the BY Motors) were designed for Machines of Class 66 and have the same mechanical construction as the B.S. Family Sewing Motors.

**BY FAMILY SEWING MOTORS** (Obsolete, superseded by the BZ Motors) were designed for Machines of Class 66, 99, 127 and 128. A special bracket and leather pulley supplied with the BY11 Family Sewing Motors permits electrification of non-electric family sewing machines.

These motors are enclosed by two housings of molded composition that join along the length of the motor. They are shaped to form a terminal box underneath the motor. The steel mounting bracket serves as the bottom cover for the terminal box.

These motors do not employ a 3-pin terminal; instead, all the electrical connections are made in the terminal box underneath the motor. A molded composition pulley is supplied for belt-driving the sewing machine.

**BZ FAMILY SEWING MOTORS**, designed for use with Machines 66-18, 66-24, 99-24, 127-23, 127-24, 128-18 and 128-23 (and for electrification of sewing machines in the field), supersedes the BY Motors. The BZ Motor is similar to the BA Motor except no 3-pin terminal can mount on the bracket.

These motors do not employ the 3-pin terminal. Instead, the lead wires for the motor, controller and spotlight and the lead wire to the appliance plug for the electric outlet are all connected in a terminal box built in the bottom of the motor. These leads are provided with strain reliefs and protection sleeves on their passage into the terminal box.

The motor bracket, which also served as a bottom cover for this built-in terminal box, has been changed to fasten to the side of the terminal box.

**RF4 FAMILY SEWING MOTORS**, designed for electrification of sewing machines in the field, consist of two cast zinc housings with the field core exposed between them. The mounting bracket is cast integrally with the pulley end cover.

No 3-pin terminal is supplied with this motor; instead it is provided with a terminal box attached to the bottom of the motor. The controller, spotlight and appliance plug leads are all fastened to the motor lead wires in the terminal box.

A metal pulley for belt-driving the machine is also furnished.

**S.E. FAMILY TYPE MOTORS** (Obsolete, superseded by the SU Motors) designed for Machines of Class 101, were the original gear drive motors for sewing machines. The motors were assembled into a single cast iron housing that held the electrical components at one end and the worm gear at the other. It assembles into an opening at the rear of the sewing machine. A sheet steel cover fits over the electrical components and protects them.

A 3-pin terminal block is supplied to fasten the controller and the SINGER light leads to the motor lead wires. The appliance cord is attached to the 3-pin terminal plug. A terminal board is used to change from A.C. to D.C.

**S.U. FAMILY TYPE MOTORS** (Obsolete), designed for Machines of Class 101, supersede the S.E. Motors. The general structure of these motors is similar to that of the S.E. Motors and differs only in the omission of the D.C.-A.C. switch and in having larger brushes.

**P.G. FAMILY TYPE MOTORS**, designed for the 15-91 Machine, are also gear drive motors. These motors are assembled into a single aluminum-cast housing. A protective sheet metal cover shields the electrical components. The motor housing fastens to the end of the sewing machine just behind the hand wheel.

All electrical connections are made at a 3-pin terminal. The appliance cord is attached to the 3-pin terminal plug.

**P.H. FAMILY TYPE MOTORS**, designed for the 201-2 Machine, are identical to the P.G. Motors except for the bobbin winder latch.

**PA2 FAMILY SEWING MOTORS** are made only in voltages below 150 volts and are designed for Machines of the 301 Class. These motors have a long shaft extension at one end to mount the gear. A cast aluminum housing holds the gear and the armature in place and a plastic commutator end cover similar to that of the BA3 Motor joins with it to cover the motor and hold the terminals.

A special harness connects the SINGER light, the controller and the appliance plug to the motor lead terminals. It uses a new style 3-pin terminal block.

These motors are mounted vertically inside the post of the sewing machine and are held in place by a sheet metal clamp and a screw.

**THE PA4 FAMILY SEWING MOTOR** is the same as the PA2 Motor except that it is completely insulated from the machine. This motor is supplied in all voltage ranges up to and including 250 volts.

**BUE MOTOR FOR FAMILY SEWING MACHINES****(BUE Motor Obsolete, Replaced by BR Motor)**

The BUE Motor is a series commutator type electric motor designed especially for use with family sewing machines. A general description of the series commutator type electric motor with suggestions for servicing will be found in Part 1, Section 2 of this Manual.

The BUE Motor is designed to be mounted on the side of the sewing machine arm by means of a cast metal bracket fitted on the hand attachment seat of the sewing machine. The motor drives the sewing machine by means of a belt. The BUE Motor is the same as the BU Motor except that it has a different bracket to mount the three-pin terminal.

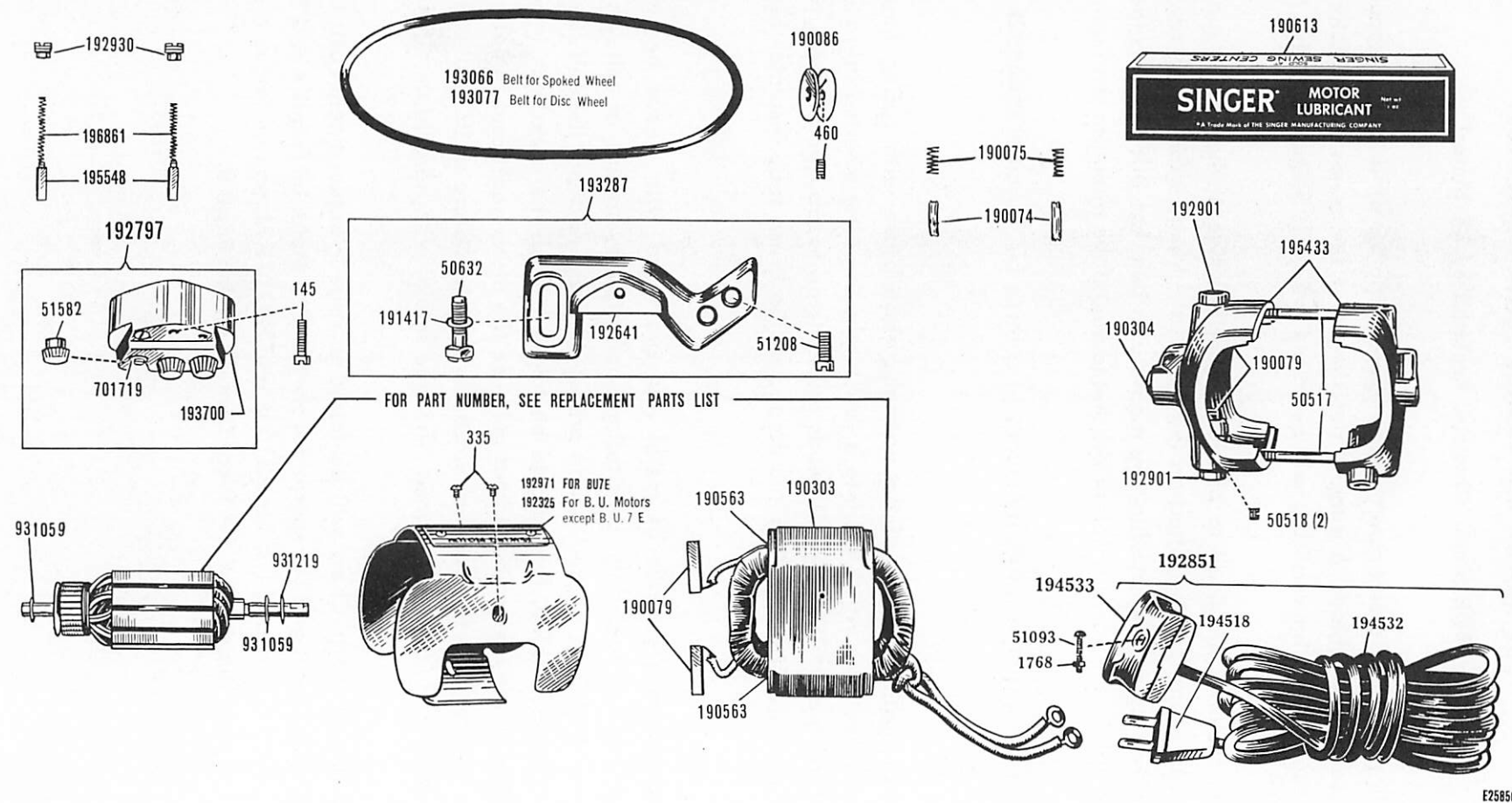
Electrical connection is made by means of a three-pin terminal mounted on the motor bracket.

The brush rigging consists of the normal carbon brush with spring housed within a hollow brass brush tube which fits into a brush tube insulator inserted into the commutator end cover of the motor. The field coil leads are soldered to tabs provided on the brass brush tube. A molded brush cap screwing into the top of the brush tube insulator holds the brush in place.

The end covers are made of metal and are fitted with sleeve bearings. The end covers are supplied in pairs only. Lubrication is effected by means of felt wicks in contact with the motor shaft and housed within grease tubes pressed into the end covers. When the motor is being reassembled, care should be taken to push the wick back into the bearing; otherwise the wick may become wedged between the motor shaft and bearing. Care should also be taken to replace the spacing washers on the armature shaft so that the correct end play, not exceeding  $1/64''$ , is obtained. The core shield, with nameplate, is made of metal.

A Replacement Parts Chart will be found on Page 2, Replacement Parts List on Page 3, Replacement Parts Chart and List special for the BU7E19 Motor on Pages 4 and 5 respectively, Replacement Parts Chart and List for BU103E and BU107E Motors on Pages 6 and 7 respectively, and a Wiring Diagram of Electrical Connections on Page 8.





E25850

Fig. 1

PARTS CHART BU3E TO BU92E MOTORS

## PARTS LIST BU3E TO BU92E MOTORS

PART NO.	DESCRIPTION	QUANTITY	CAT NO.	VOLTS	CYCLES	ARMATURE NO.	SET FIELD COILS NO.
**	Armature Complete	1	BU3E	32	D.C. Only	190007	193000
931059	Armature Thrust Washer, 1/32" thick	As Req'd.	BU5E	50	DC & 25/75	190041	193012
931219	Armature Thrust Washer, 3/64" thick	As Req'd.	BU6E	95-100	DC & 25/75	190035	193015
**	Field Coils Complete	1	BU7E	100-110	DC & 25/75	190035	193003
190303	Field Core	1	BU7E-4	230-250	DC & 25/75	193167	193027
190563	Field Coil Retainer	2	BU7E-5	115-125	DC & 25/75	193200	193018
195433 (2, 7)	Set End Covers Complete	1	BU7E-6	100-110	DC & 25/75	193321	193003
190551 (5)	Brush Holder Complete	2	BU7E-8	115-130	DC & 25/75	190047	193018
195548 (4)	Carbon Brush	2	BU7E-13	65	DC & 25/75	193490	727918
196861 (4)	Brush Spring	2	BU7E-16	6	D.C. Only	193768	794244
192930 (5)	Brush Cap	2					794245
50518	Brush Tube Set Screw	2	BU7E-17	12	D.C. Only	794275	794276
190304	C.E. Cover Bearing Cap	1					794277
192971	Core Shield, for BU7-E	1	BU7E-21	100-110	DC & 25/75	190035	193003
192325 (1, 2)	Core Shield, except BU7-E	1	BU8E	115-125	DC & 25/75	190043	193018
335	Core Shield Fastening Screw	2	BU9E	150-165	DC & 25/75	190045	193021
50517	End Cover Screws	2	BU10E	200-220	DC & 25/75	190037	193024
190074	Grease Cup Wick	2	BU11E	210-230	DC & 25/75	193167	193024
190075	Grease Cup Spring	2	BU12E	230-250	DC & 25/75	193167	193282
190086	Motor Pulley with Set Screw	1	BU15E	130-145	DC & 25/75	190047	193030
460	Motor Pulley Set Screw	1	BU87E	100-110	80-100	190049	193006
192797 (3)	Three-Pin Terminal (Male) Complete	1	BU90E	200-220	80-100	192164	193009
193700 (3)	Three-Pin Terminal Body	1	BU92E	230-250	80-100	190037	193033
701719	Three-Pin Terminal Washer	3					
51582 (3)	Three-Pin Terminal Nut	3					
145	Three-Pin Terminal Mounting Screw	1					
193287 (2, 6)	Motor Bracket Complete	1					
192641 (2)	Motor Bracket Only	1					
50632	Motor Screw—To Machine	1					
191417	Motor Screw Washer	1					
51208	Motor Mounting Screw—To Bracket	1					

\*\*See Listing Under Catalog Number

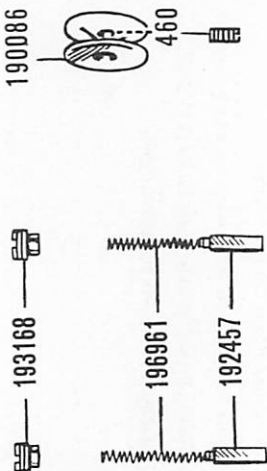
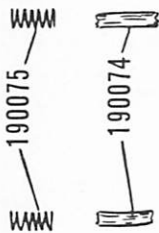
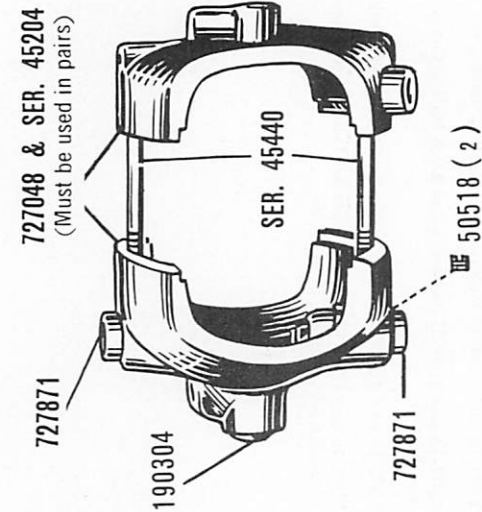
- (1) State Catalog Number of Motor for which intended  
 (2) Specify Brown Wrinkle Finish for BU7E21 Only  
 (3) Specify Brown Finish for BU7E21 Only

(4) For BU7E-16 and BU7E-17 Motors, order Brush Complete No. 194060

(5) For BU7E-16 and BU7E-17 Motors, order Brush Holder Complete No. 794410 and Brush Cap No. 964221

(6) For BU7E-16 and BU7E-17 Motors, order Motor Bracket Complete No. 192828

(7) For BU7E-16 and BU7E-17 Motors, order Set End Covers Complete similar to No. 195433 except for BU7E-16 Motor



190613

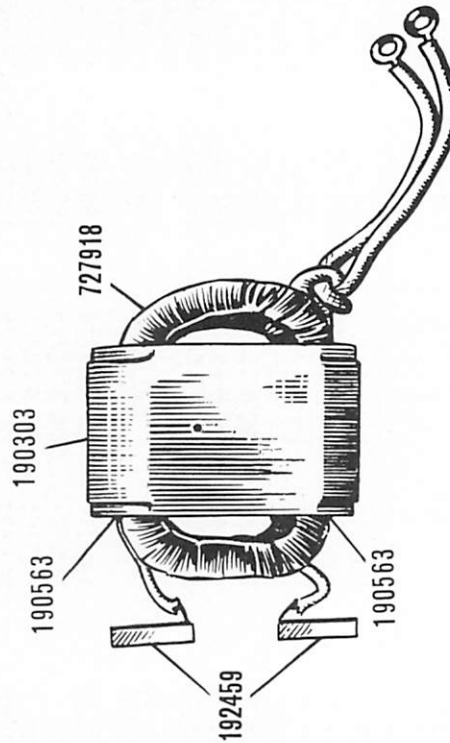
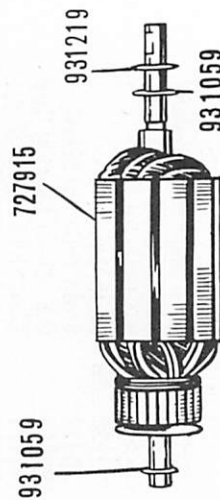
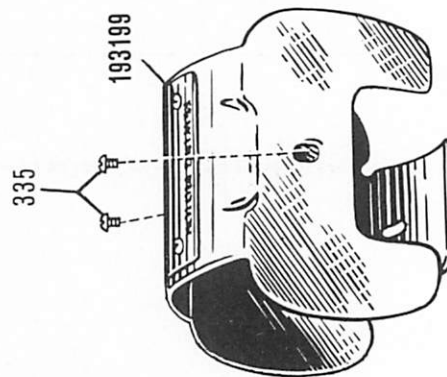


Fig.2  
PARTS CHART BU7E-9 MOTOR

E25851

## PARTS LIST FOR BU7E-9 MOTOR ONLY

PART NO.	DESCRIPTION	QUANTITY
727918	Field Coils	1
727915	Armature Complete	1
931059	Armature Thrust Washer, 1/32" thick	As Req'd.
931219	Armature Thrust Washer, 3/64" thick	As Req'd.
190303	Field Core	1
190563	Field Coil Retainer	2
727048 } Ser. 45204 }	End Covers—Must be Ordered in Pairs	1
192459	Brush Tube	2
727871	Brush Tube Insulation	2
192457	Carbon Brush	2
196961	Brush Spring	2
193168	Brush Cap	2
50518	Brush Tube Set Screw	2
190304	C.E. Cover Bearing Cap	1
193199	Core Shield	1
335	Core Shield Fastening Screw	2
Ser. 45440	End Cover Screws	2
190074	Grease Cup Wick	2
190075	Grease Cup Spring	2
190086	Motor Pulley With Set Screw	1
460	Motor Pulley Set Screw	1



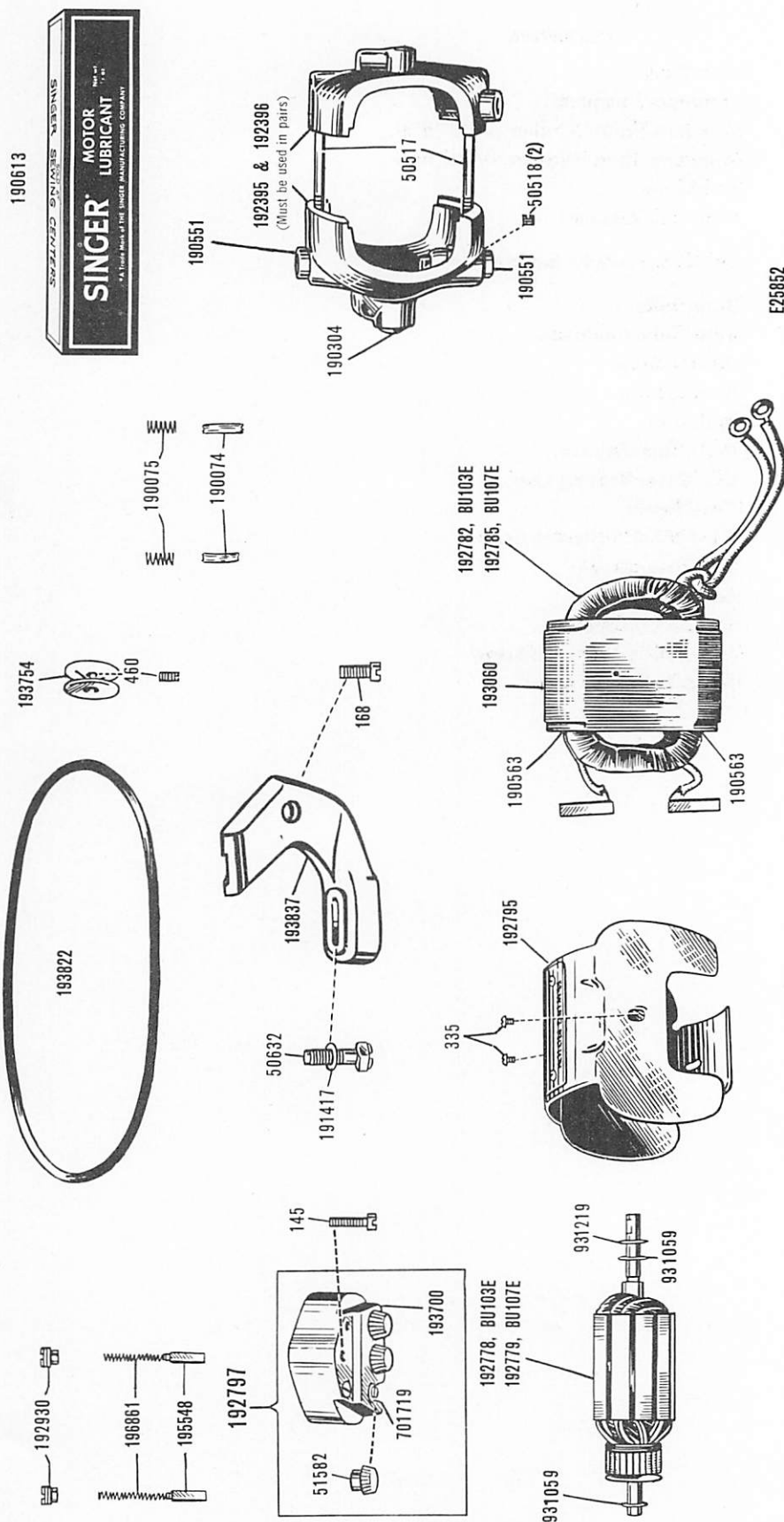


Fig. 3  
PARTS CHART BU103E AND BU107E MOTORS

## PARTS CHART FOR BU103E AND BU107E MOTORS ONLY

PART NO.	DESCRIPTION	QUANTITY
192778	Armature Complete for BU103E	1
192779	Armature Complete for BU107E	1
931059	Armature Thrust Washer, 1/32" thick	As Req'd.
931219	Armature Thrust Washer, 3/64" thick	As Req'd.
193060	Field Core	1
192782	Field Coils Complete for BU103E	1
192785	Field Coils Complete for BU107E	1
190563	Field Coil Retainer	2
192395 } 192396 }	End Covers—Must be Ordered in Pairs	1
190551	Brush Holder Complete	2
195548	Carbon Brush	2
196681	Brush Spring	2
192930	Brush Cap	2
50518	Brush Tube Set Screw	2
190304	C.E. Cover Bearing Cap	1
192795	Core Shield	1
335	Core Shield Fastening Screw	2
50517	End Cover Screws	2
193834	Grease Cup Complete	2
190074	Grease Cup Wick	2
190075	Grease Cup Spring	2
193754	Motor Pulley with Set Screw	1
460	Motor Pulley Set Screw	1
192797	Three-Pin Terminal (Male) Complete	1
193700	Three-Pin Terminal Body	1
701719	Three-Pin Terminal Washer	3
51582	Three-Pin Terminal Nut	3
193837	Motor Bracket	1
50632	Motor Bracket Screw to Base	1
191417	Motor Bracket Screw Washer	1
168	Motor Bracket Screw to Motor	1
193822	Motor Belt	1
193836	Lead Tube	1
193838	Three-Pin Terminal Bracket	1
190	Three-Pin Terminal Bracket Screw to Machine	1

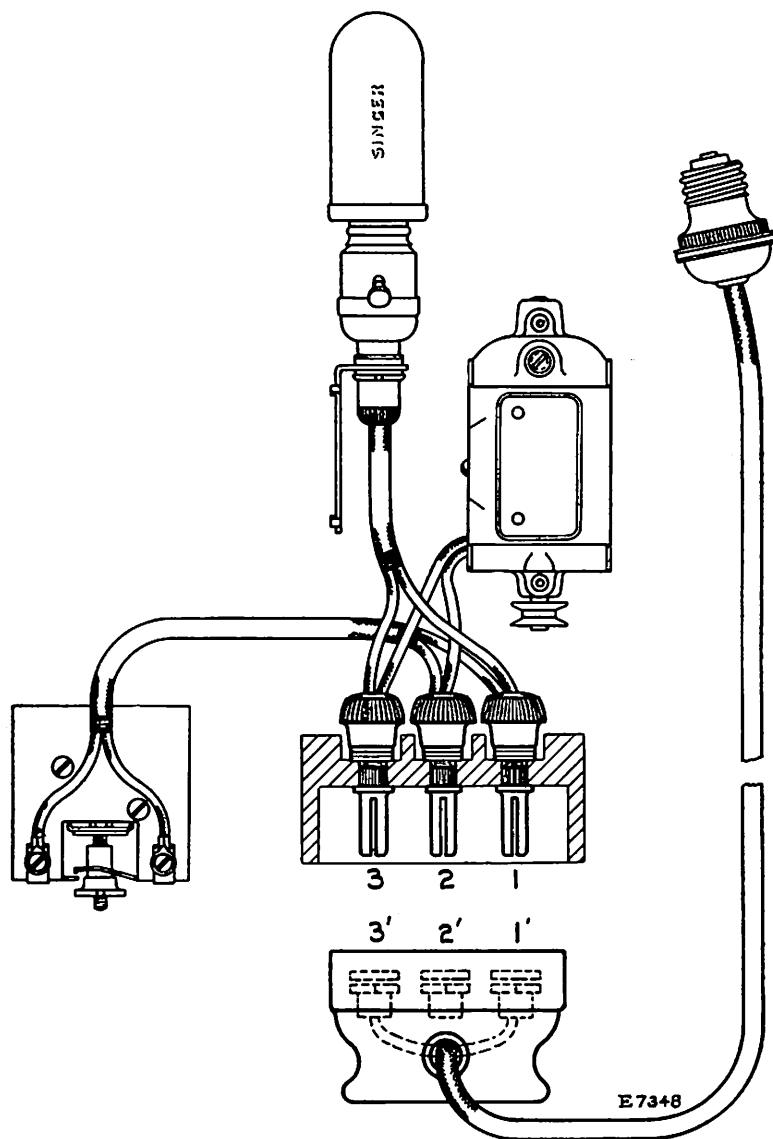


Fig. 4

WIRING DIAGRAM—BUE MOTORS

**BU MOTORS FOR FAMILY SEWING MACHINES****(BU Motors Obsolete, Replaced by BUE Motors)**

The BU Motor is a series commutator type electric motor designed especially for use with family sewing machines. A general description of the series commutator type electric motor with suggestions for servicing will be found in Part 1, Section 2 of this Manual.

The BU Motor is designed to be mounted on the side of the sewing machine arm by means of a bracket fitted on the hand attachment seat of the sewing machine, except on the Class 24 Machine where the motors were mounted under the bed by special brackets. The motor has a metal pulley and drives the machine by means of a belt. Connection of the line lead to motor, light and controller were made in the cabinet and for this reason several varieties of BU Motors were made as follows; using the -7 rating as an example:

BU7-A	Knee Control on Portable Machines
BU7-B	Knee Control on Stands and Tables
BU7-C	Foot Control
BU7-D	Knee Control, 66-6 Machine on Library Set #20
BU107	Knee Control, 24-65 Machine, Portable Set #130205
BU107A	Foot Control, 24-65 Machine, Portable
BU107C	Knee Control, 24-67 Machine, Cabinet #40
BU107P	Knee Control, 24-65 Machine, Portable
BU107S	Knee Control, 24-68 Machine, Portable Set #205
BU107L	Knee Control, 24-69 Machine, Cabinets #40 and 47
BU207	Foot Control, 24-63 Machine on Stands
BU207F	Foot Control, 24-63 Machine, Portable
BU307	Treadle Control, 177-2 Darning Machine

The brush rigging consists of the normal carbon brush with spring housed within a hollow brass brush tube which fits into a brush tube insulator inserted into the commutator end cover of the motor. The field coil leads are soldered to tabs provided on the brass brush tube. A molded brush cap screwing into the top of the brush tube insulator holds the brush in place.

The end covers are made of metal and are provided with sleeve bearings. The end covers are supplied in pairs only. Lubrication is effected by means of felt wicks in contact with the motor shaft and housed within grease tubes pressed into the end covers. When the motor is being reassembled, care should be taken to push the wick back into the bearing; otherwise the wick may become wedged between the motor shaft and bearing. Care should also be taken to replace the spacing washers on the armature shaft so that the correct end play, not exceeding  $1/64''$ , is obtained. The core shield, with nameplate, is made of metal.

Replacement Parts Charts will be found on Page 2 for BU3 to BU92 and BU303 to BU312 Motors and on Page 5 for BU107 and BU207 Motors. Replacement Parts Lists will be found on Pages 3 and 4 for BU3 to BU92 and BU303 to BU312 Motors and on Pages 6 and 7 for BU107 and BU207 Motors. Wiring Diagrams of the various BU Motors will be found on Pages 8 to 16 inclusive.



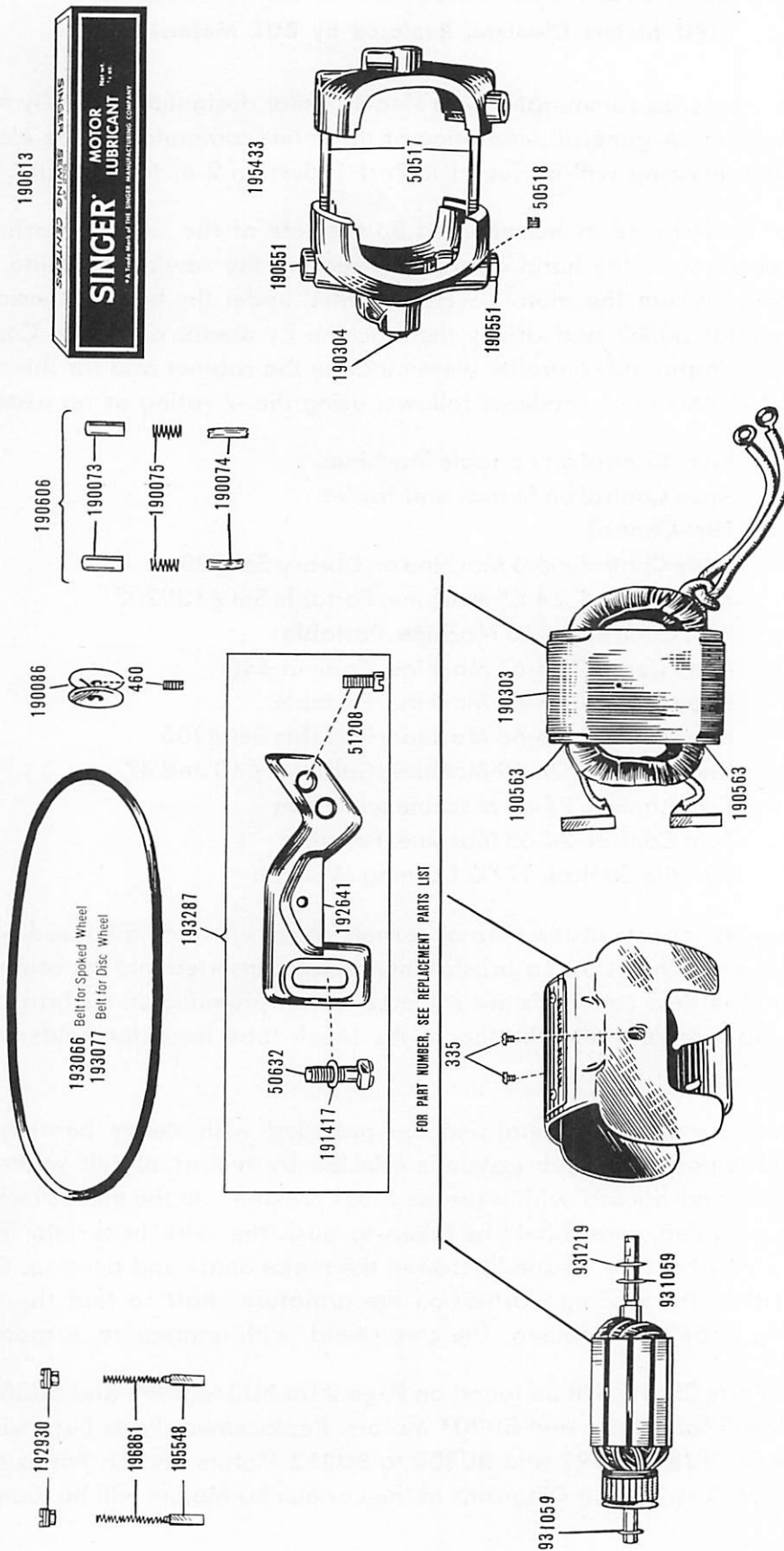


Fig.1

PARTS CHART BU3 TO BU92 AND BU303 TO BU312 MOTORS

## PARTS LIST FOR BU3 TO BU92 AND BU303 TO BU312 MOTORS

PART NO.	DESCRIPTION	QUANTITY
**	Armature Complete	1
931059	Armature Thrust Washer, 1/32" thick	As Req'd.
931219	Armature Thrust Washer, 3/64" thick	As Req'd.
190303	Field Core	1
**	Field Coils Complete	1
190563	Field Coil Retainer	2
195433 (3)	End Covers Complete	1
190551	Brush Holder Complete	2
195548	Carbon Brush	2
196861	Brush Spring	2
192930	Brush Cap	2
50518	Brush Holder Set Screw	2
190304	C.E. Cover Bearing Cap	1
50517	End Cover Screws	2
190606	Grease Tube Complete	2
190073	Grease Tube	2
190074	Grease Tube Wick	2
190075	Grease Tube Spring	2
190086	Motor Pulley with Set Screw	1
460	Motor Pulley Set Screw	1
193287 (2)	Motor Bracket Complete	1
192641	Motor Bracket	1
50632	Motor Bracket Screw to Machine	1
191417	Motor Bracket Screw Washer	1
51208 (2)	Motor Bracket Screw to Motor	1
192322	Core Shield with Nameplate for BU7A	1
192323	Core Shield with Nameplate for BU7B	1
192324	Core Shield with Nameplate for BU7C	1
192325 (1)	Core Shield with Name Plate Blank	1
194275	Core Shield with Nameplate for BU307	1
194506 (1)	Core Shield with Nameplate for BU308, BU311 & BU312	1

(1) State Catalog Number of Motor for which intended

(2) Not Used with BU307, BU308, BU311 and BU312 Motors

(3) For BU307, BU308, BU311 and BU312 order End Covers Nos. 192120 and 194267 in pairs

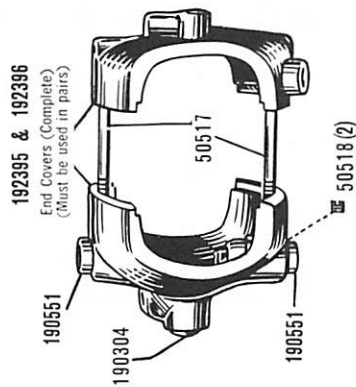
(Continued on Page 4)

## PARTS LIST FOR BU3 TO BU92 AND BU303 TO BU312 MOTORS, Continued

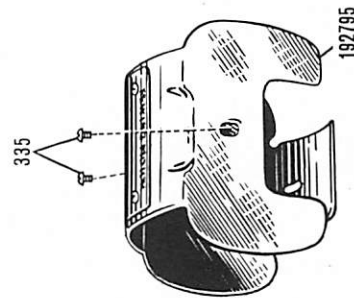
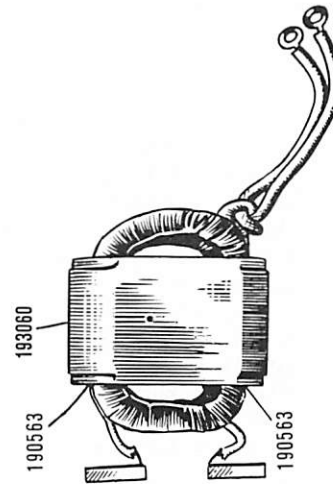
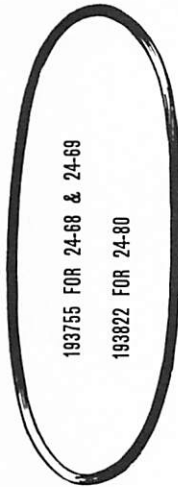
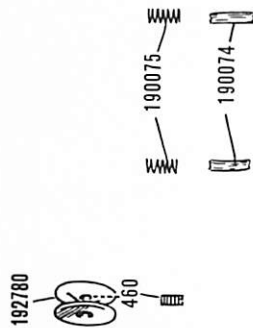
CAT NO.	VOLTS	CYCLES	ARMATURE NO.	SET OF FIELD COILS COMPLETE			
				"A" LEADS NO.	"B" LEADS NO.	"C" LEADS NO.	"D" LEADS NO.
BU3	32	DC Only	190007	192601	192621	192621	
BU5	50	DC & 25/75	190041	192602	192622	192622	
BU6	95-100	DC & 25/75	190035	192603	192623	192623	
BU7	100-110	DC & 25/75	190035	192604	192624	192624	192132 and 192327
BU8	115-125	DC & 25/75	190043	192605	192625	192625	
BU9	150-165	DC & 25/75	190045	192606	192626	192626	
BU10	200-220	DC & 25/75	193379	192607	192627	192627	
BU11	210-230	DC & 25/75	193167	192607	192627	192627	
BU12	230-250	DC & 25/75	193167	192608	192628	192628	
BU15	130-145	DC & 25/75	190047	192609	192629	192629	
BU87	100-110	80-100	190049	192610	192630	192630	
BU90	200-220	80-100	192164	192611	192631	192631	
BU92	230-250	80-100	190037	192612	192632	192632	
BU307	100-110	DC & 25/75	190035	194271			
BU308	115-125	DC & 25/75	190043	194600			
BU311	210-230	DC & 25/75	194502	194503			
BU312	230-250	DC & 25/75	193167	194534			

## ELECTRICAL PARTS OTHER THAN MOTOR PARTS

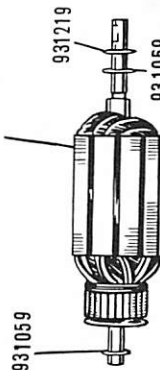
PART NO.	DESCRIPTION	QUANTITY
190900	Line Lead for BU3D to BU92D Motors	1
190984	Line Lead for BU3A to BU92A and BU3B to BU92B Motors	1
192241	Line Lead for BU3C to BU92C Motors	1
191914	Lead Bushing for BU3A to BU92A Motors	1
192142	Lead Bushing for BU3B to BU92B Motors	1
191915	Lead Bushing Retainer for BU3A to BU92A Motors	1
192143	Lead Bushing Retainer for BU3B to BU92B Motors	1
191926	Twin Terminal Complete for BU3A to BU92A Motors	1
191934	Twin Terminal Complete for BU3B to BU92B Motors	1
191930	Single Terminal Complete for BU3A to BU92A and BU3B and BU92B Motors	1
191937	Screw Eye for BU3B to BU92B Motors	1
192307	Controller Lead Cord Clamp Complete for BU3B to BU7B Motors	1



E25854



FOR PART NUMBER, SEE REPLACEMENT  
PARTS LIST



PARTS CHART FOR BU107 AND BU207 MOTORS

(See Parts List on following page)

## PARTS LIST FOR BU107 AND BU207 MOTORS

PART NO.	DESCRIPTION	QUANTITY
**	Armature Complete	1
931059	Armature Thrust Washer, 1/32" Thick	As Req'd.
931219	Armature Thrust Washer, 3/64" Thick	As Req'd.
193060	Field Core	1
**	Field Coils Complete	1
190563	Field Coil Retainer	2
192395}	End Covers Complete Must be ordered in pairs	1
192396}		
190551		
195548	Brush Holder Complete	2
196861	Carbon Brush	2
192930	Brush Spring	2
50518	Brush Cap	2
190304	Brush Holder Set Screw	2
50517	Commutator End Cover Bearing Cap	1
191087 (1)	End Cover Screws	2
191092	Grease Tube Complete, BU107	2
190074	Grease Tube Complete, BU207	2
190075	Grease Tube Wick	2
192780 (2)	Grease Tube Spring	2
460	Motor Pulley with Set Screw	1
192795 (3)	Motor Pulley Set Screw	1
335	Core Shield	1
191137	Core Shield Set Screw	2
190268	Idler Lever Complete	1
190095	Idler Lever	1
190096	Idler Lever Pulley Complete	1
190097	Idler Lever Pulley	1
50516	Idler Lever Pulley Bushing	1
1654	Idler Lever Pulley Screw	1
190445	Idler Lever Pulley Screw Nut	1
701	Idler Lever Pulley Screw Washer	1
192218	Idler Lever Hinge Screw	1
191050	Idler Lever Spring	1
193122	Motor Bracket, for BU107 and BU107A	1
193753	Motor Bracket, for BU107C and BU107P	1
191134	Motor Bracket, for BU107L and BU107S	1
168	Motor Bracket, for BU207 and BU207F	1
134	Motor Bracket Screw, to Motor	1
192914	Motor Bracket Screw, to Machine	1
193151	Lead Tube, for BU107P and BU107S	1
	Lead Tube, for BU107C, BU107L and BU207F	1

\*\*See under Catalog Number on Page 7

- (1) Use Grease Tube Complete No. 194475 for BU107S
- (2) Use Motor Pulley with Set Screw No. 193754 BU107S
- (3) State Catalog Number when ordering

(Continued on Page 7)

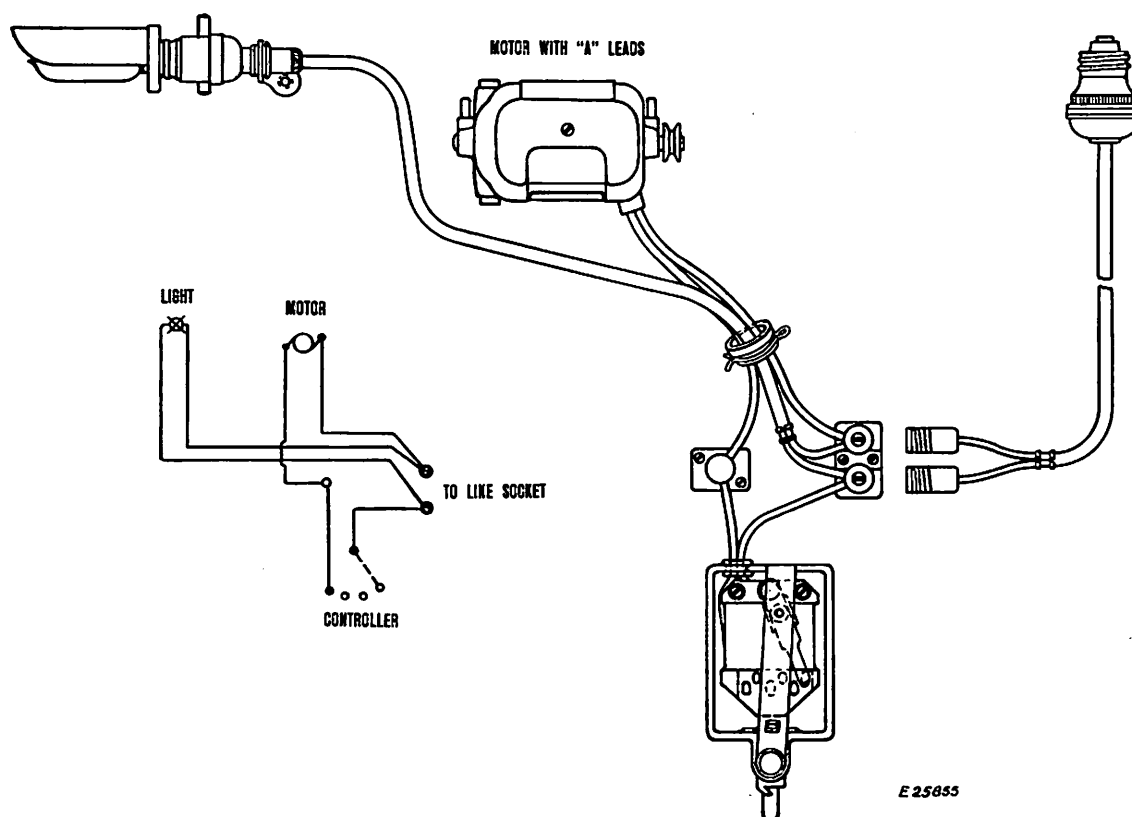


## PARTS LIST FOR BU107 AND BU207 MOTORS, Continued

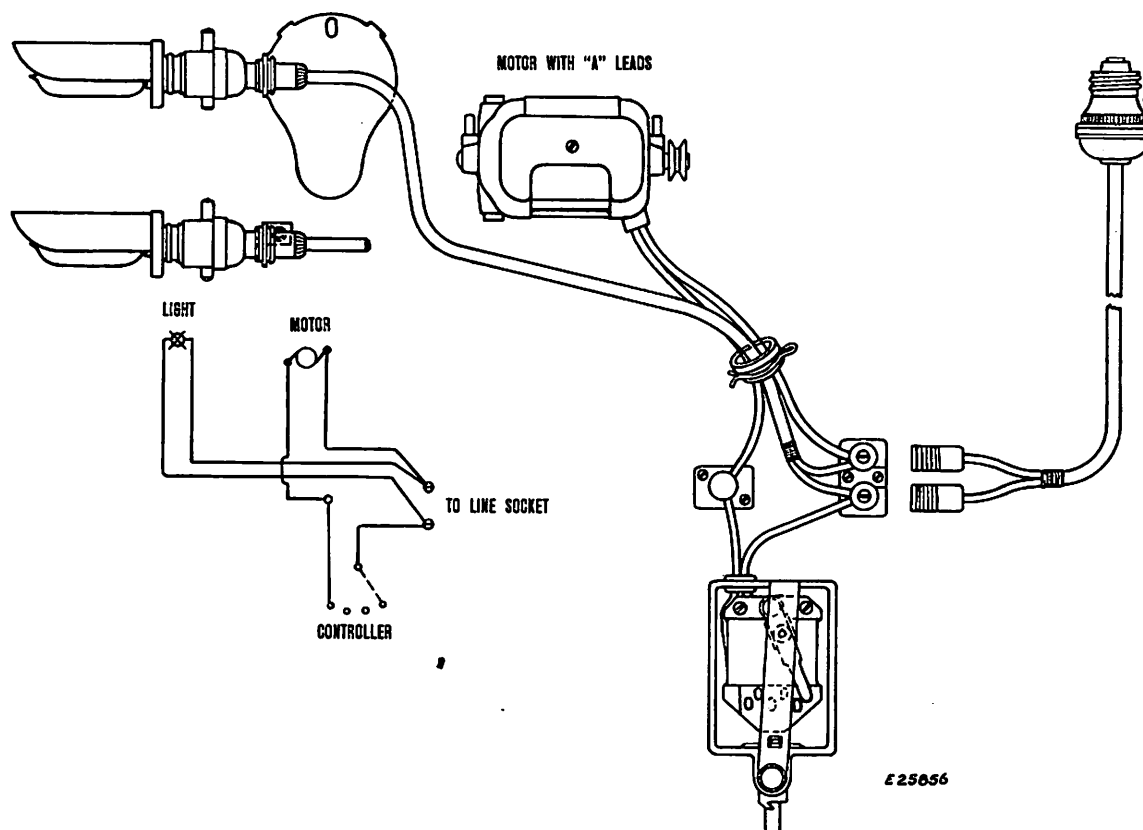
CAT. NO.	VOLTS	CYCLES	ARMATURE NO.	FIELD COILS NO.
BU103	32	D.C. Only	192778	192782
BU107	100-110	D.C. & 25/75	192779	192785
BU103A	32	D.C. Only	192778	192782
BU107A	100-110	D.C. & 25/75	192779	192785
BU107C	100-110	D.C. & 25/75	192779	193172
BU107L	100-110	D.C. & 25/75	192779	193172
BU107P	100-110	D.C. & 25/75	192779	193140
BU107S	100-110	D.C. & 25/75	192779	193140
BU203	32	D.C. Only	192778	192782
BU207	100-110	D.C. & 25/75	192779	192785
BU207F	100-110	D.C. & 25/75	192779	193172

## ELECTRICAL PARTS OTHER THAN MOTOR PARTS

PART NO.	DESCRIPTION	QUANTITY
190984	Line Lead for BU107	1
191089	Line Lead for BU207	1
192851	Line Lead for BU107C, L, P and S	1
192441	Lead Bushing for BU107	1
193108	Lead Bushing for BU107C, L, P and S	1
191915	Lead Bushing Retainer for BU107, BU107C, L, P and S	1
192446	Twin Terminal Complete for BU107 and BU107A	1
192797	Three-Pin Terminal, Male Half, Complete for BU107C, L, P, S and BU207F	1
192802	Screw Eye for BU107 and BU107A	2
193150	Lead Clamp, Double, for BU107C and L	1
192909	Lead Clamp, Double, for BU107C and L	1
192918	Lead Clamp, Single, for BU107C, L, P, S, and BU207F	1
193	Lead Clamp Screw for BU107C and L	2
193151	Motor Lead Tube for BU107C, L and BU207F	1
192915	Light Lead Tube for BU107C	1
192912	Light Lead Tube for BU107L	1
192914	Controller Lead Tube for BU107C	1
193726	Controller Lead Tube for BU107L	1
192995	Controller Cover for BU107P and S	1
192996	Controller Cover for Three-Pin Terminal Bracket for BU107P, S and BU207F	1
193044	Controller Driver for BU107P and S	1
192926	Controller Driver Connecting Link for BU107P and S	1



**Fig. 3. Wiring Diagram for BU3A to BU92A Motors on 99 Machine in Portable Set No. 201**



**Fig. 4. Wiring Diagram for BU3A to BU92A Motors on 128 Machine in Portable Set No. 200**

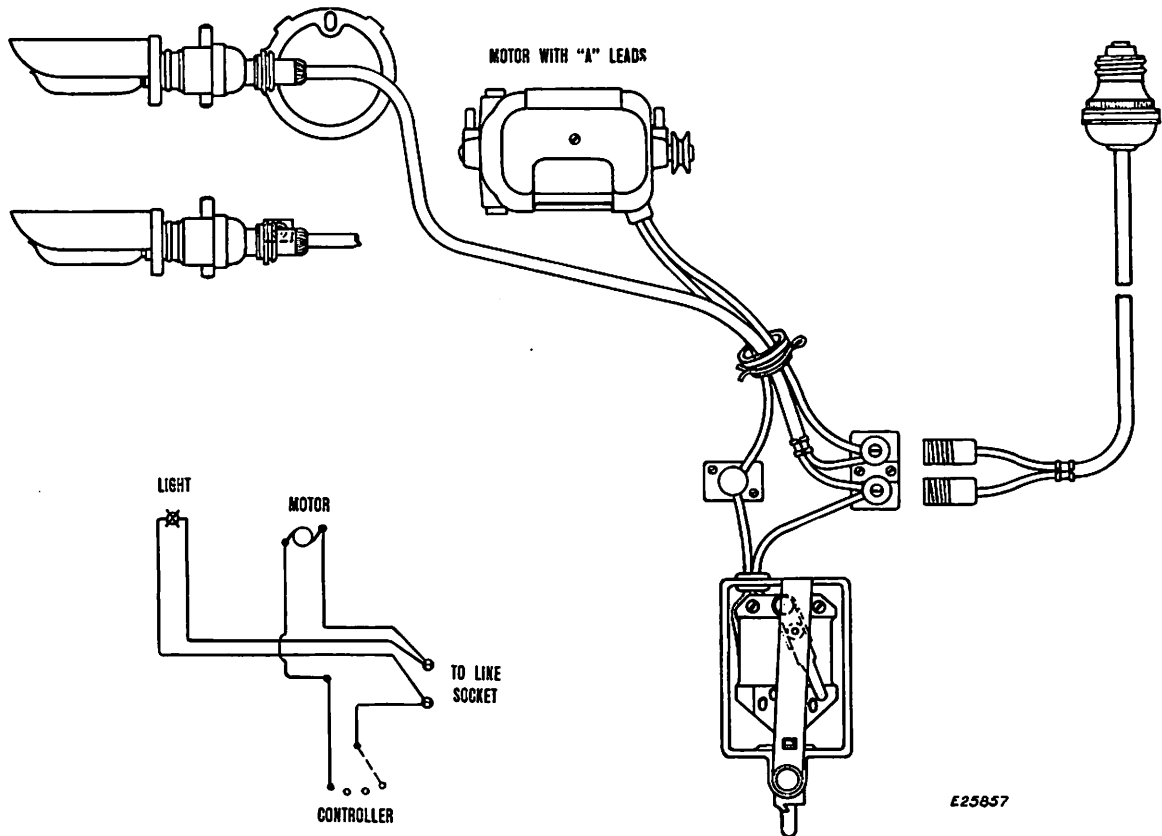


Fig. 5. Wiring Diagram for BU3A to BU92A Motors on 15, 66, 115 and 127 Machines in Portable Set No. 212

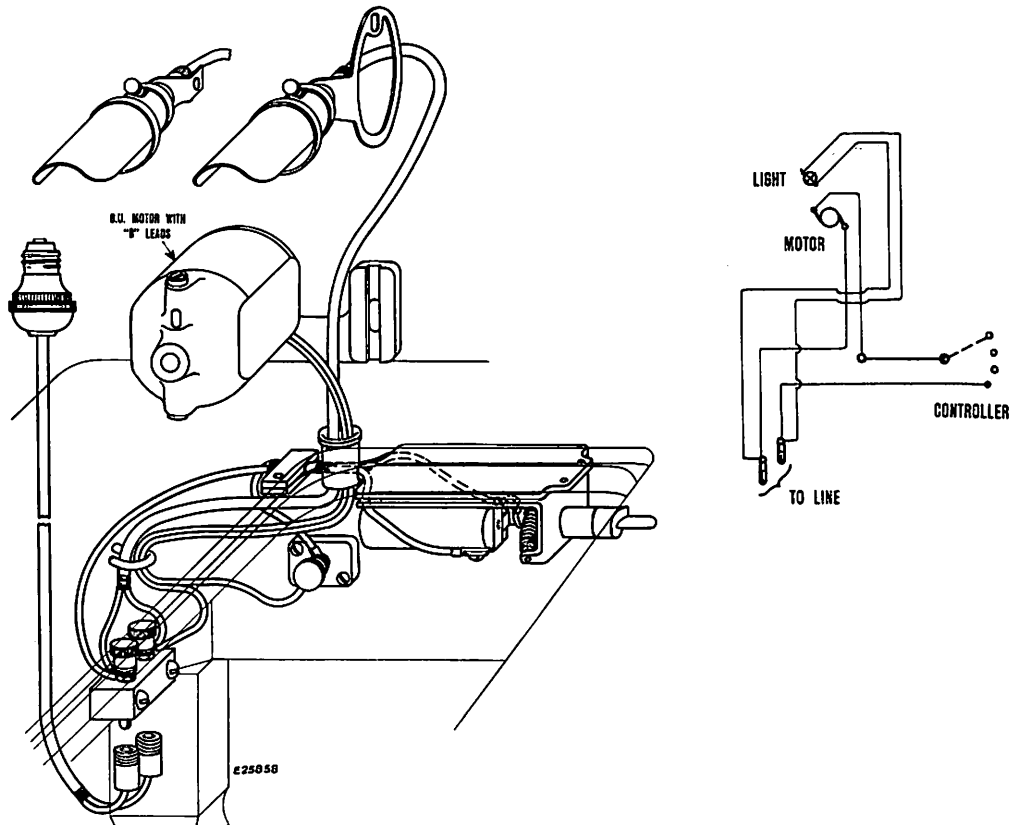


Fig. 6. Wiring Diagram for BU3B to BU92B Motors on 15, 66, 115 and 127 Machines in Cabinet Set No. 302

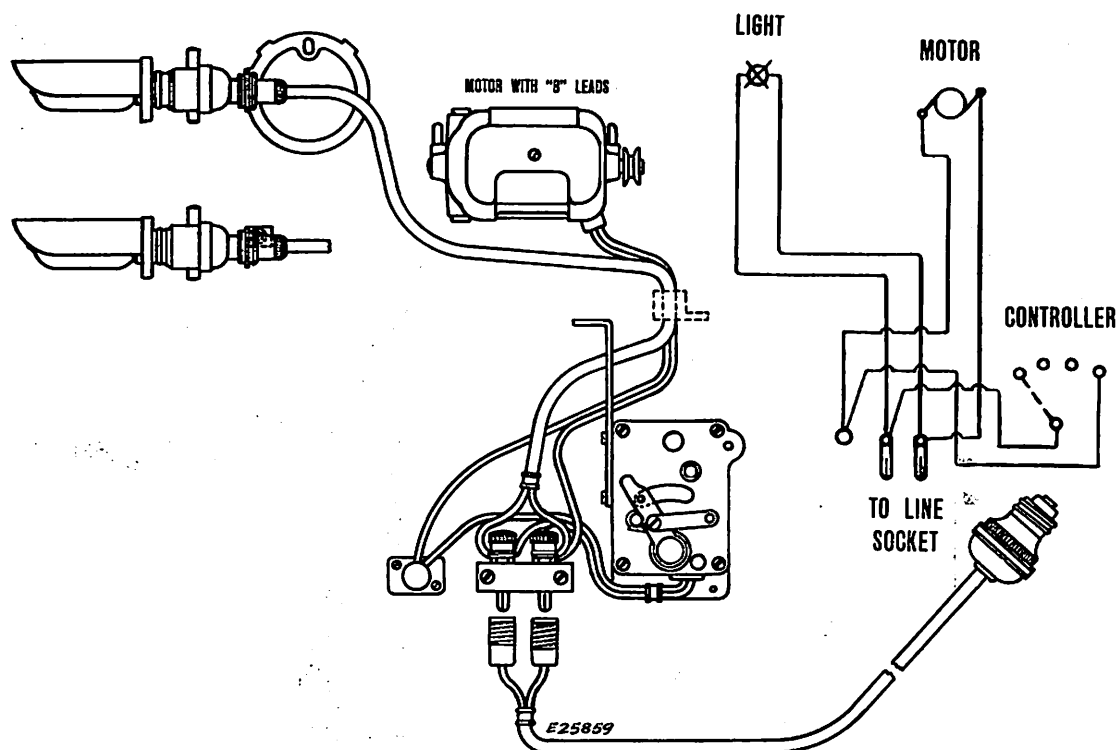


Fig. 7. Wiring Diagram for BU3B to BU92B Motors on 66-6 Machine in Cabinet Set No. 20

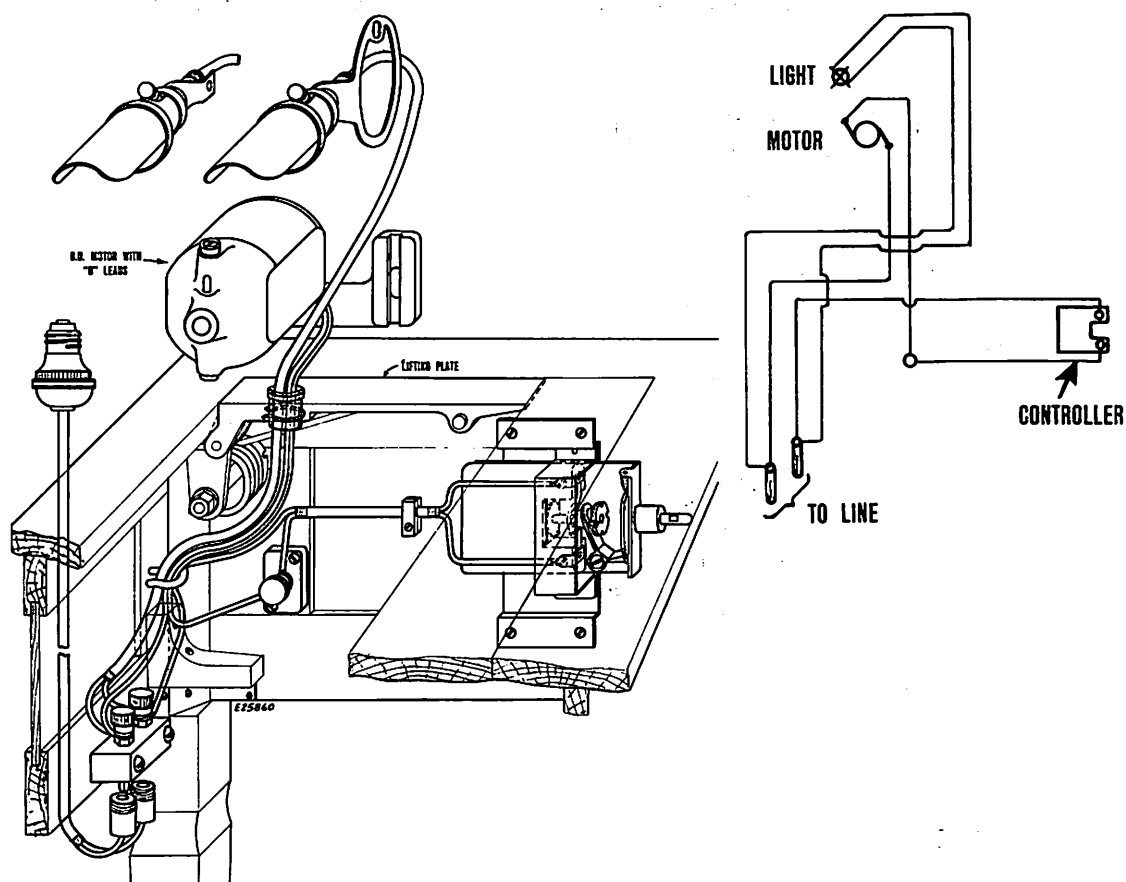


Fig. 8. Wiring Diagram for BU3B to BU92B Motors on 15, 66, 115 and 127 Machines in Cabinet Set Nos. 40 and 305

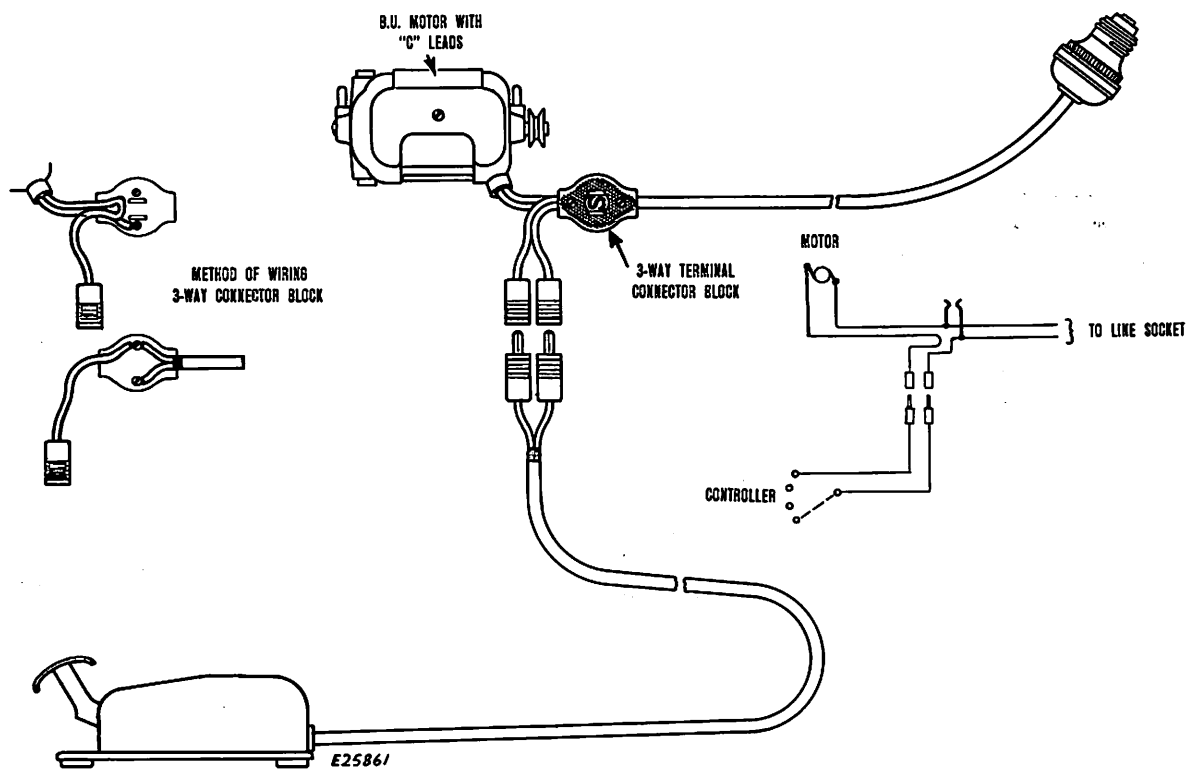


Fig. 9. Wiring Diagram for BU3C to BU92C Motors with Foot Control

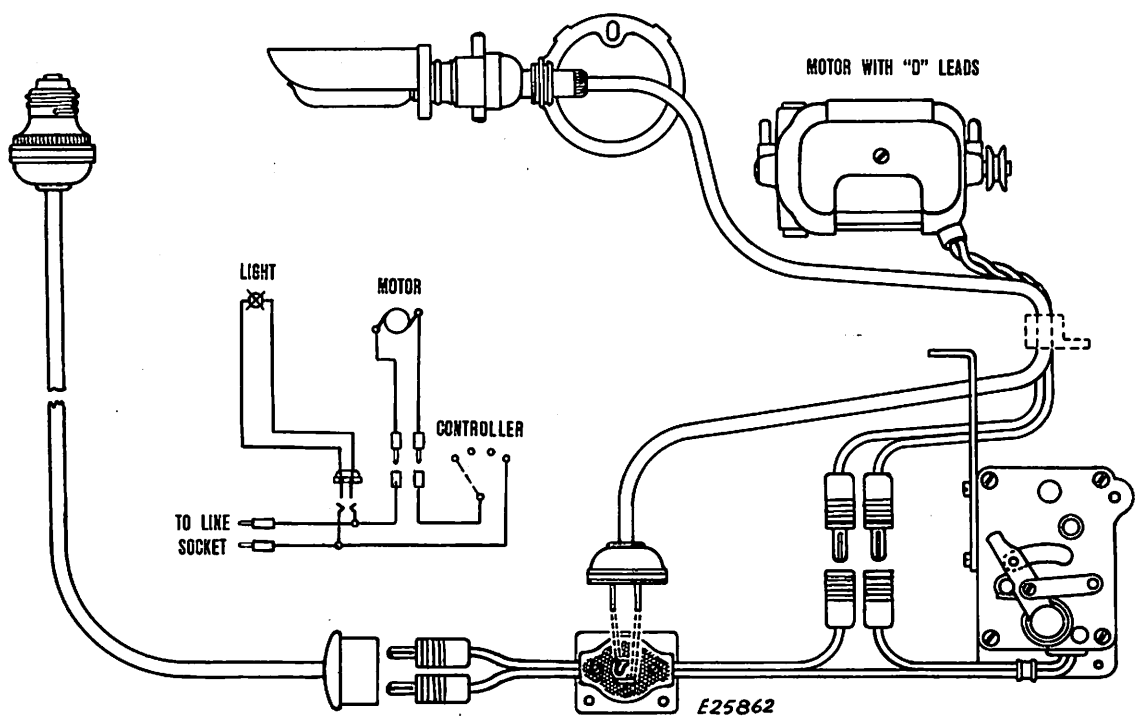


Fig. 10. Wiring Diagram for BU3D to BU92D Motors on 66-6 Machine in Cabinet Set No. 20



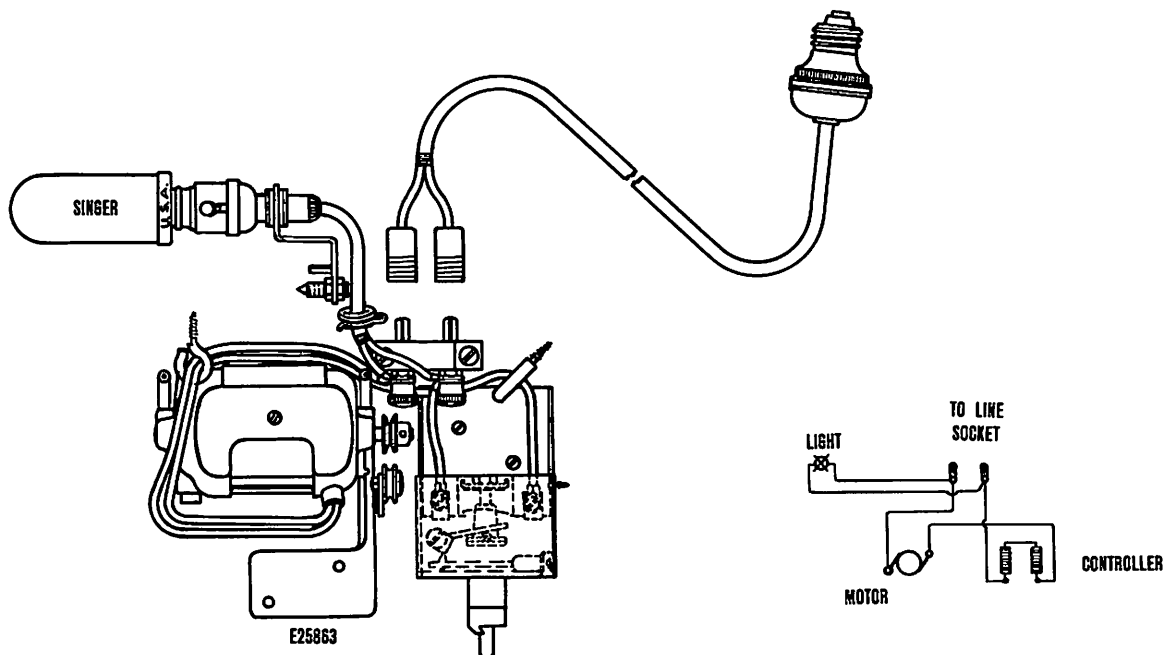


Fig. 11. Wiring Diagram for BU107 Motor on 24-65 Machine in Portable Set No. 130205

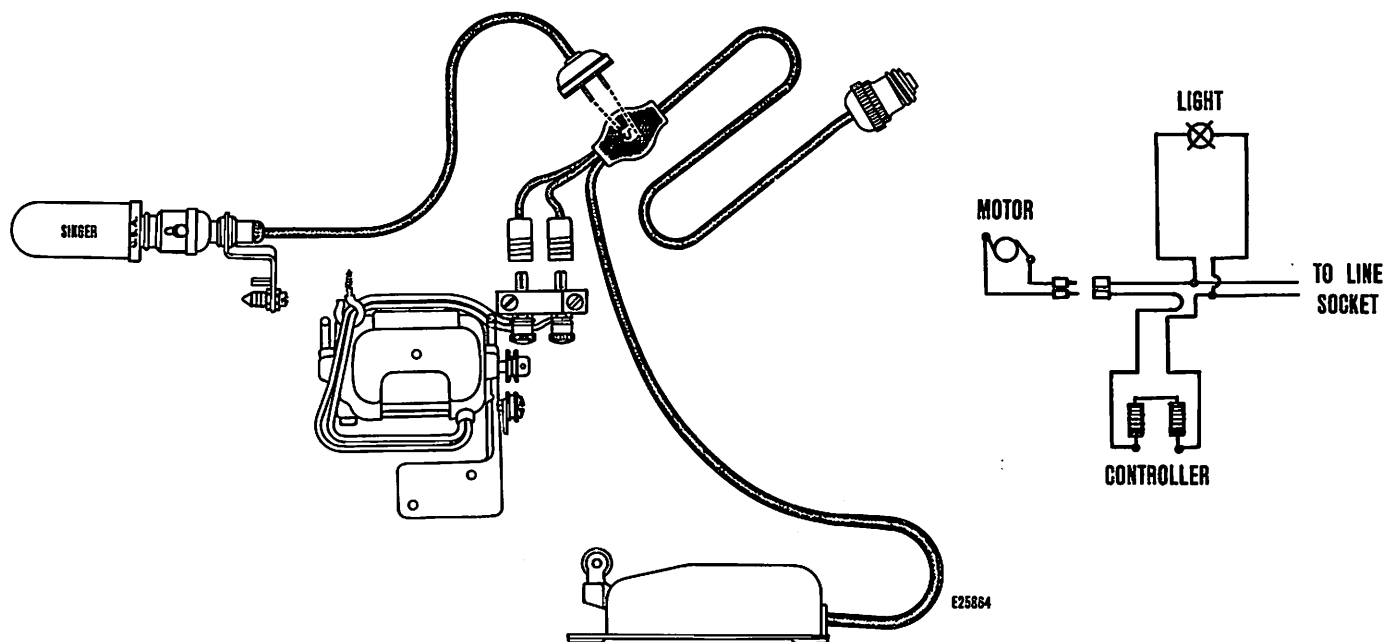


Fig. 12. Wiring Diagram for BU107A Motor on 24-65 Machine with Foot Control

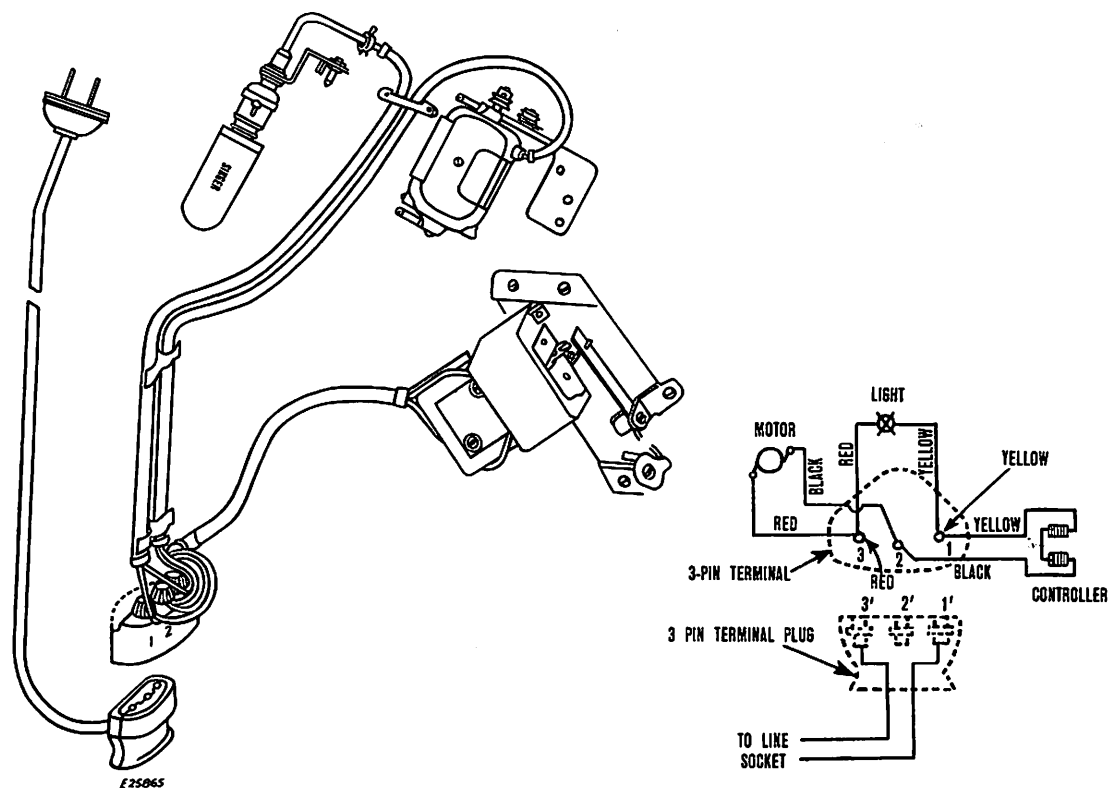


Fig. 13. Wiring Diagram for BU107-C Motor on 24-67 Machine in Cabinet Set No. 40

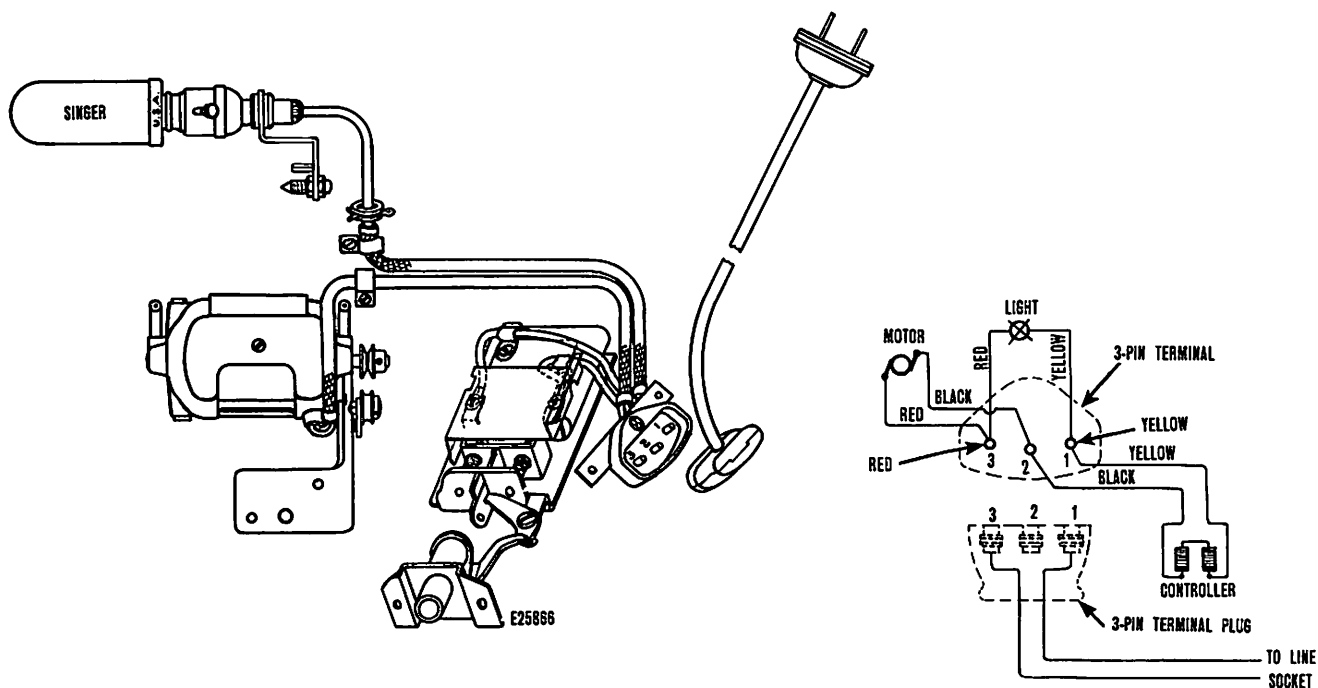
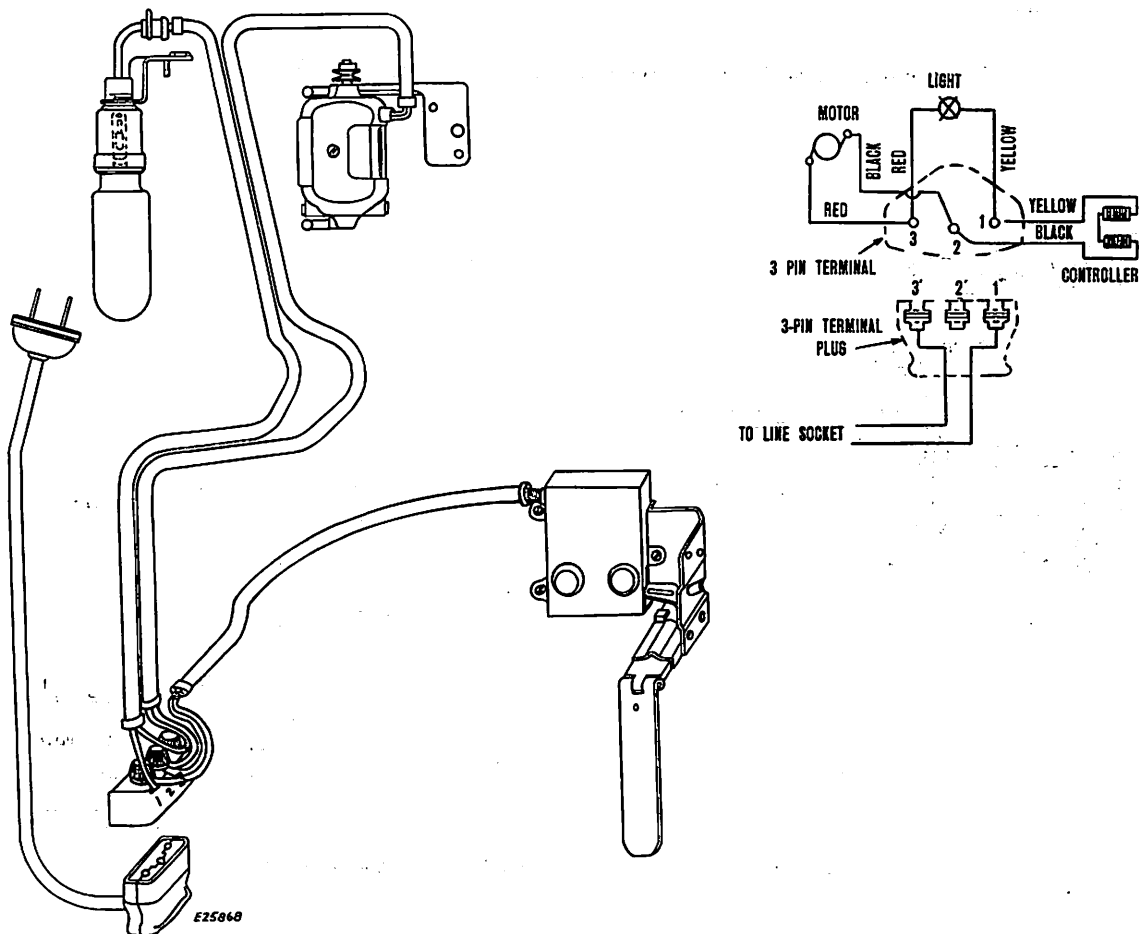
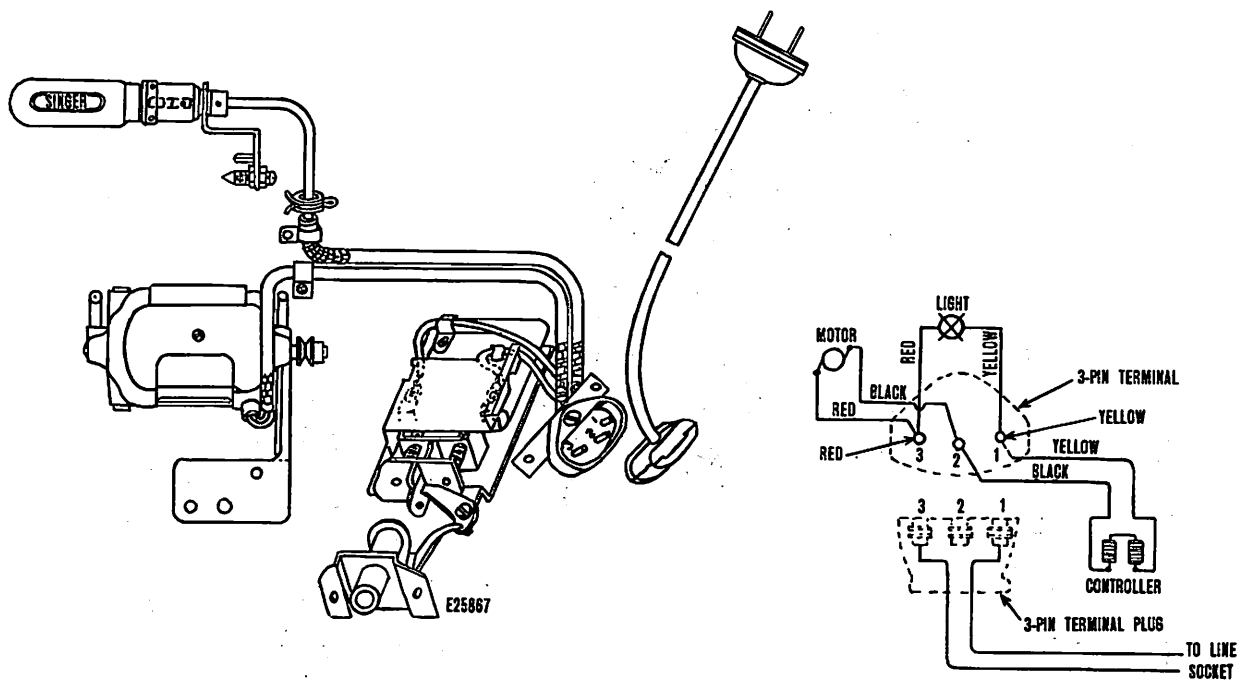


Fig. 14. Wiring Diagram for BU107P Motor on 24-65 Machine in Portable Set No. 205



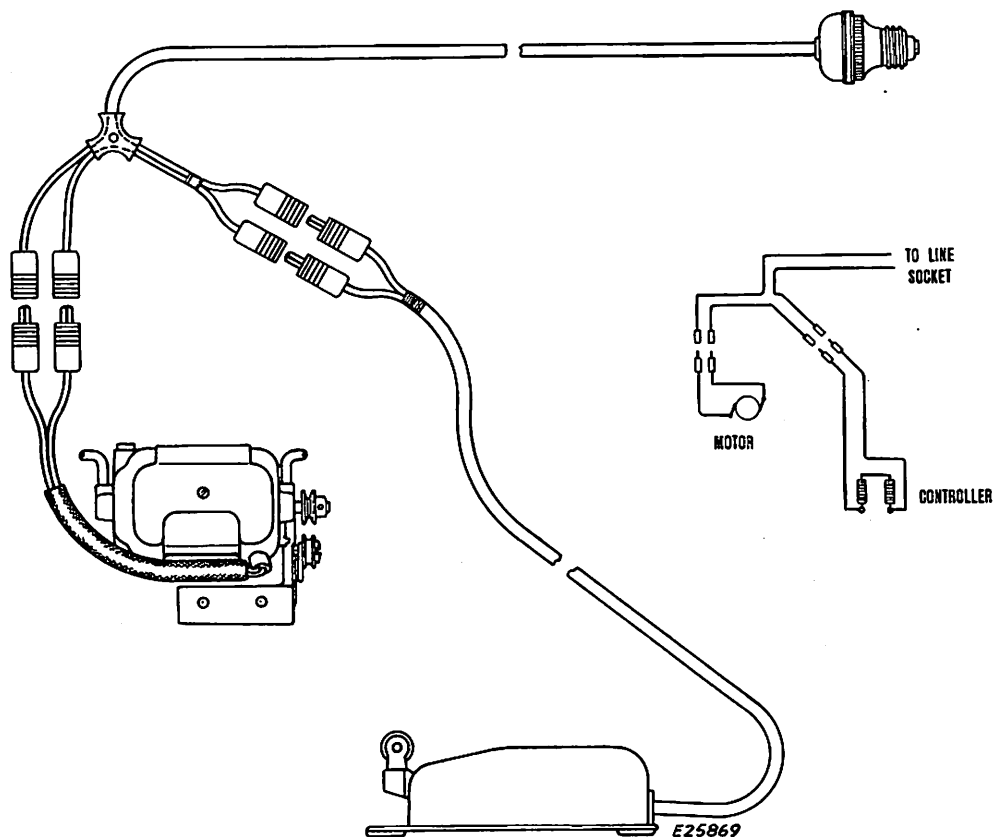


Fig. 17. Wiring Diagram for BU207 Motor on 24-63 Machine with Foot Control

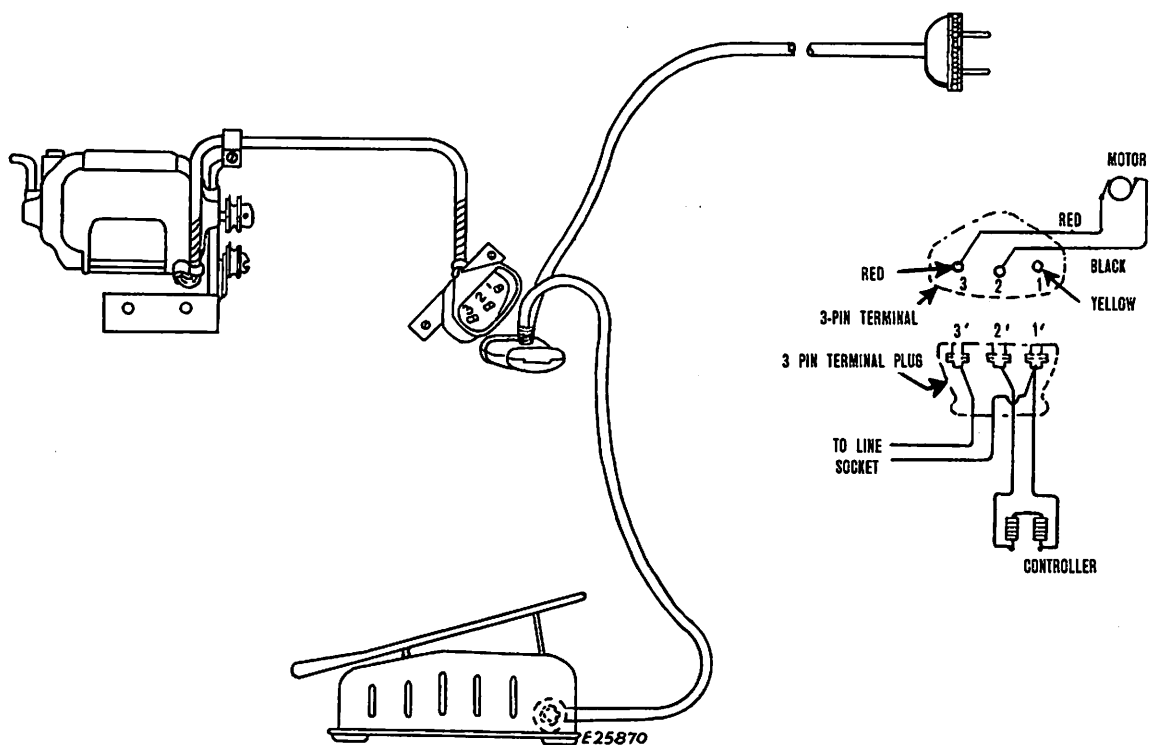


Fig. 18. Wiring Diagram for BU207F Motor on 24-63 Machine with Foot Control

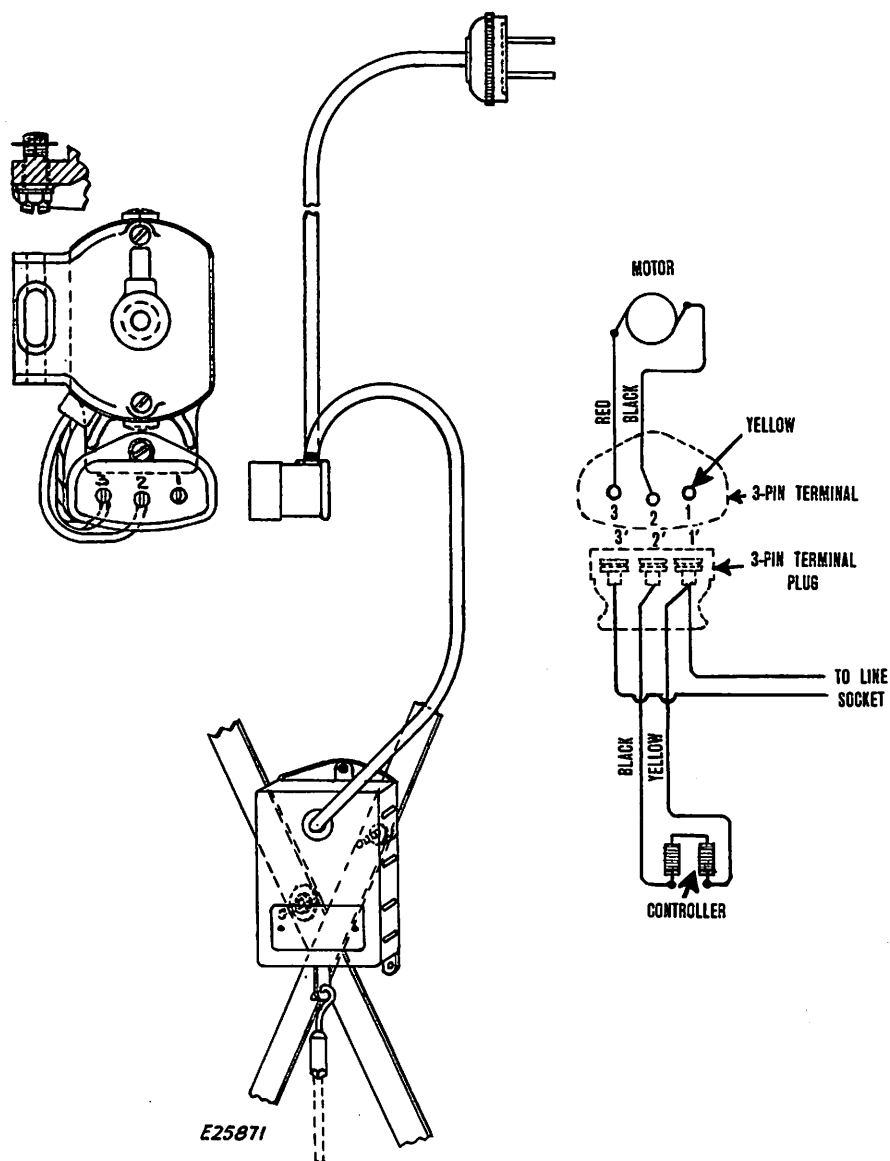


Fig. 19. Wiring Diagram for BU307 Motor



**BT MOTORS FOR FAMILY SEWING MACHINES****(BT Motor Obsolete, Replaced by BU Motor)**

The BT Motor is a series commutator type electric motor designed especially for use with family sewing machines. A general description of the series commutator type electric motor with suggestions for servicing will be found in Part 1, Section 2 of this manual.

The BT Motor operates on both Alternating Current and Direct Current but is not a universal motor. A screw on the terminal board must be inserted in hole "A" to operate on Alternating Current and in hole "D" to operate on Direct Current, see Parts Chart on Page 2.

The electrical connection of the BT Motor varied. In some installations the motor and controller leads were connected to two round pins on the cabinet and the line lead was equipped with plugs to connect to these pins. In others, only the controller lead was connected to the pins, the motor leads and line lead being joined in a three-way connector block with a lead ending in plugs for connection to the pins. When the sewing light was introduced, it was also connected in the three way connector block. This block was later redesigned to include a two-prong outlet and the light lead was then equipped with a two-pin male plug for connection to the outlet.

The first BT Motors had an idler pulley on an arm to take up the slack in the belt. The mounting hole in the bracket was changed to a slot to properly adjust belt tension and the idler pulley eliminated.

The brush rigging consists of the normal carbon brush with spring housed within a hollow brass brush tube which fits into a brush tube insulator inserted into the commutator end cover. The field coil leads are soldered to tabs provided on the brass brush tubes. A brush cap screwing into the top of the brush tube insulator holds the brush in place.

The end covers are made of metal and are provided with sleeve bearings. The end covers are supplied in pairs only. Lubrication is effected by means of felt wicks in contact with the motor shaft and housed within grease tubes pressed into the end covers. When the motor is being reassembled, care should be taken to push the wicks back into the bearing; otherwise, the wick may become wedged between the motor shaft and the bearing. Care should also be taken to replace the spacing washers on the armature shaft so the correct end play, not exceeding  $1/64"$ , is obtained.

The terminal board is housed within a metal terminal box under the motor. A metal core shield surrounds the field core.

Replacement Parts Charts will be found on Page 2 for BT7 to BT92 Motors and on Page 4 for BT107 to BT192 Motors. Replacement Parts Lists will be found on Pages 3 for BT7 to BT92 Motors and 5 for BT107 to BT192 Motors and Wiring Diagrams will be found on Pages 6, 7 and 8.

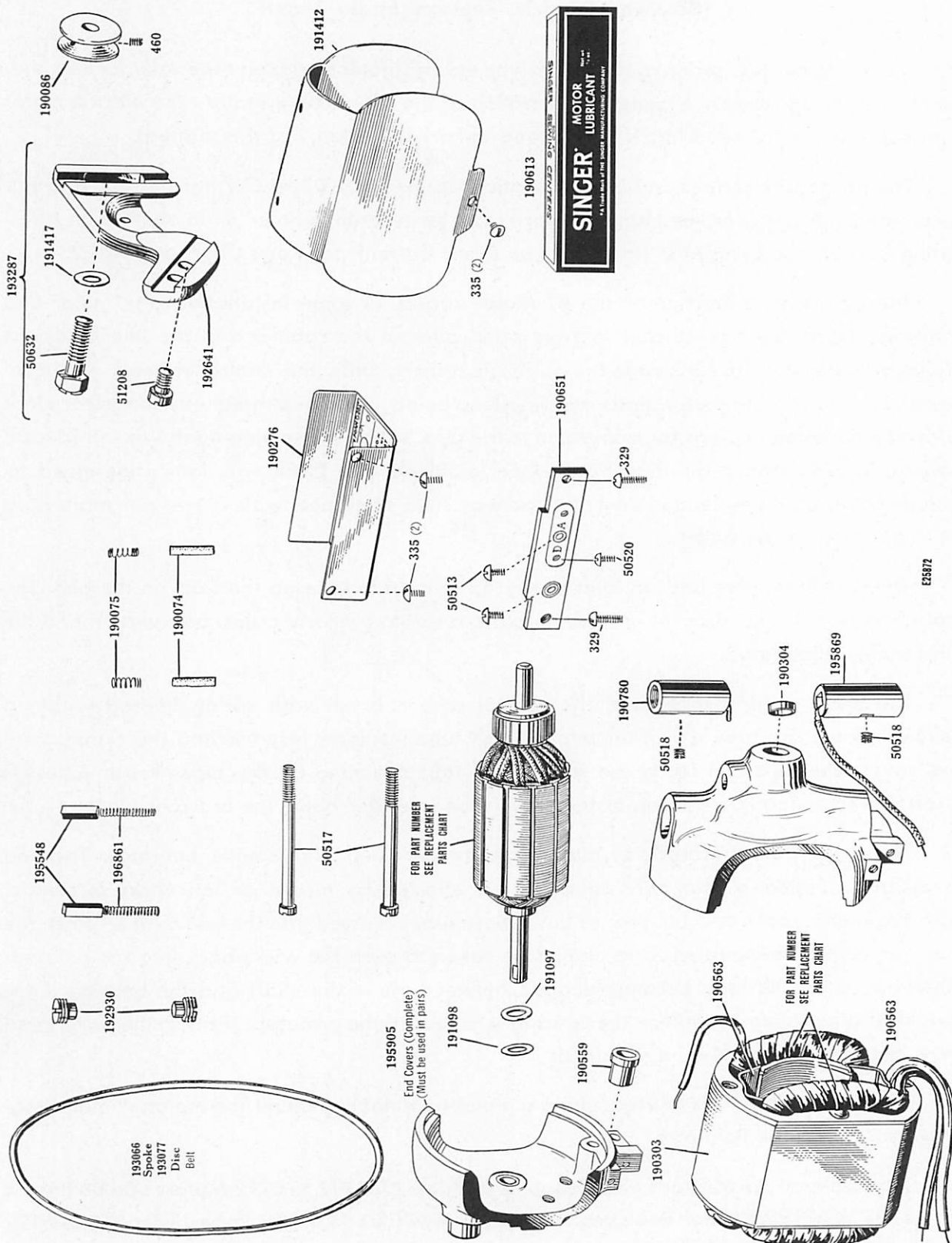


Fig. 1  
PARTS CHART FOR BT7 TO BT92 MOTORS

## PARTS LIST BT7 TO BT92 MOTORS

PART NO.	DESCRIPTION	QUANTITY	CAT. NO.	VOLTS	CYCLES	ARMATURE NO.	FIELD COILS NO. (1)
**	Armature Complete	1	BT7	100-110	60 & D.C.	190001	190415 & 190416
191097	Armature Thrust Washer, 1/64" thick	As Req'd.	BT8	115-125	60 & D.C.	190003	190415 & 190418
191098	Armature Thrust Washer, .015" thick	As Req'd.	BT10	200-220	60 & D.C.	190005	190421 & 190422
**	Field Coils Complete	1	BT12	230-250	60 & D.C.	190006	190421 & 190426
190303	Field Core	1	BT13	32	D.C.	190007	190675 & 190676
190563	Field Coil Retainer	2	BT14	70	D.C.	192331	192332 & 192333
195905	End Covers Complete	1	BT17	100-110	50 & D.C.	190001	190415 & 190807
190780	Brush Tube with Insulation	1	BT18	115-125	50 & D.C.	190003	190415 & 190868
195869	Brush Tube with Insulation and Lead	1	BT19	150-165	50 & D.C.	190819	190820 & 190821
195548	Carbon Brush	2	BT20	200-220	50 & D.C.	190005	190421 & 190800
196861	Brush Spring	2	BT21	210-230	50 & D.C.	190006	190421 & 190800
192930	Brush Cap	2	BT22	230-250	50 & D.C.	190006	190421 & 190799
50518	Brush Tube Set Screw	2	BT24	50	50 & D.C.	191102	191103 & 191104
190304	C.E. Cover Bearing Cap	1	BT25	130-145	50 & D.C.	190033	191904 & 191905
191412	Core Shield	1	BT27	100-110	25 & 33-1/3	190001	190415 & 190887
335	Core Shield Fastening Screw	2	BT28	115-125	25 & 33-1/3	190003	190415 & 191071
50517	End Cover Screws	2	BT29	150-165	25 & 33-1/3	191819	190820 & 191072
190074	Grease Cup Wick	2	BT30	200-220	25 & 33-1/3	190005	190421 & 190933
190075	Grease Cup Spring	2	BT32	230-250	25 & 33-1/3	190006	190421 & 190891
190086	Motor Pulley with Set Screw	1	BT38	115-125	25 & D.C.	190003	190415 & 191383
460	Motor Pulley Set Screw	1	BT47	100-110	40 & 60	190001	190892 & 190893
193287	Motor Bracket Complete	1	BT48	115-125	40 & 60	190003	190892 & 190890
192641	Motor Bracket Only	1	BT49	150-165	40 & 60	190819	191005 & 191006
50632	Motor Screw, to Machine	1	BT50	200-220	40 & 60	190005	190894 & 190895
191417	Motor Screw Washer	1	BT52	230-250	40 & 60	190006	190894 & 190896
51208	Motor Screw, to Bracket	1	BT57	100-110	40 & D.C.	190001	190415 & 190927
190651	Terminal Board	1	BT58	115-125	40 & D.C.	190003	190415 & 191155
50520	Insert Screw	1	BT59	150-165	40 & D.C.	190819	190820 & 191168
329	Terminal Board Fastening Screw	2	BT60	200-220	40 & D.C.	190005	190421 & 190799
50513	Terminal Screw	2	BT62	230-250	40 & D.C.	190006	190421 & 191231
190276	Terminal Cover	1	BT65	95-120	50 & D.C.	190001	190892 & 191327
335	Terminal Cover Fastening Screw	2	BT77	100-110	67 & 83	190001	191056 & 191057
190444	Idle Lever Complete	1	BT80	200-220	67 & 83	190005	191058 & 191059
190268	Idle Lever Only	1	BT82	230-250	67 & 83	190006	191058 & 191060
190095	Idle Lever Pulley	1	BT87	100-110	85 & 100	190001	191044 & 191045
50516	Idle Lever Screw	1	BT90	200-220	85 & 100	190005	191047 & 191048
1654	Idle Lever Nut	1	BT92	230-250	85 & 100	190006	191047 & 191049
190445	Idle Lever Washer	2					
190559	Lead Bushing	1					

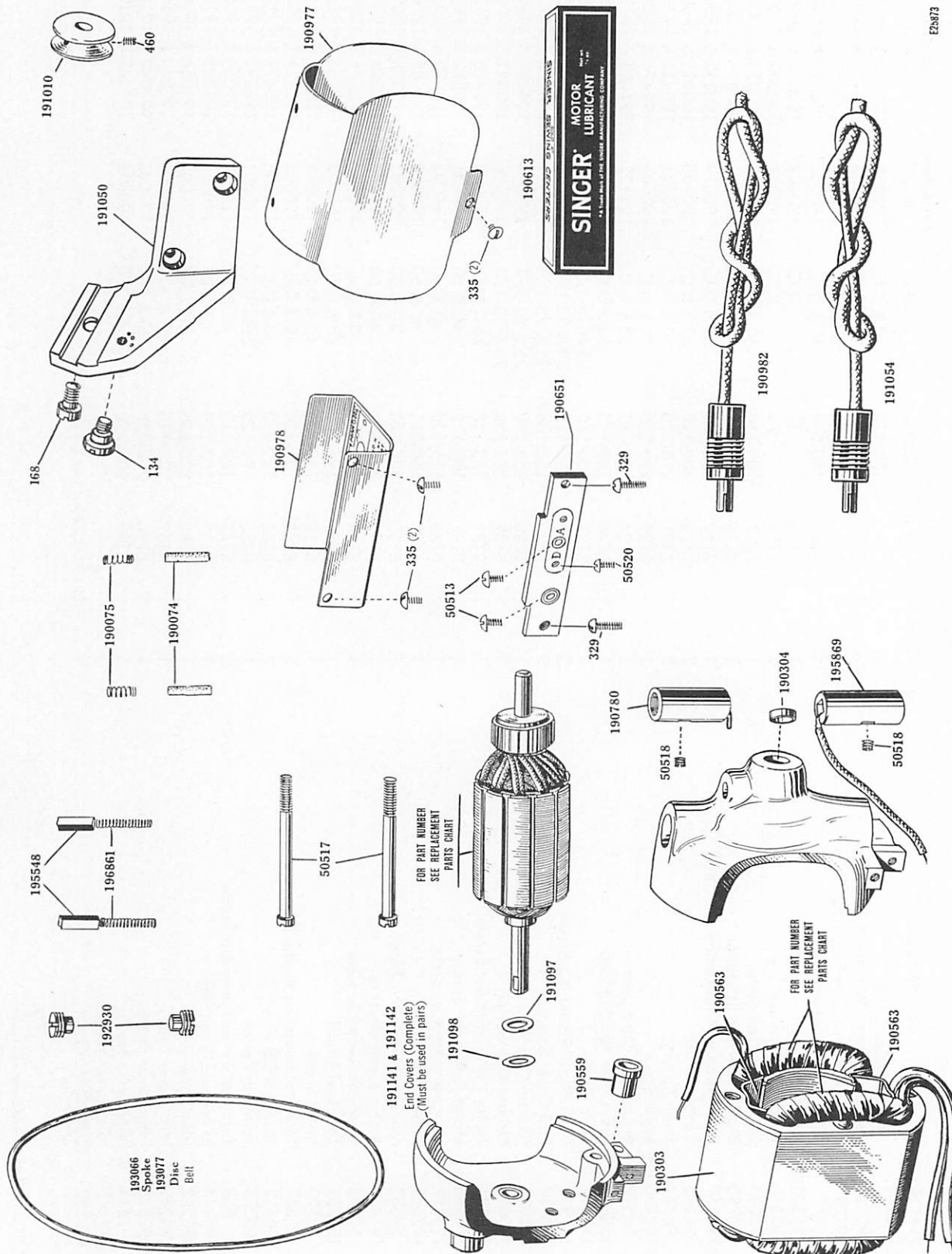
(1) Must be ordered in Pairs

\*\*See Listing under Catalog Number

(1256)

(Insert in Form 20596)

PRINTED  
IN  
U.S.A.



**Fig. 2**  
**PARTS CHART BT107 TO BT192 MOTORS**

## PARTS LIST BT107 TO BT192 MOTORS

PART NO.	DESCRIPTION	QUANTITY	CAT NO.	VOLTS	CYCLES	ARMATURE NO.	FIELD COILS NO. (1)
**	Armature Complete	1	BT107	100-110	60 & D.C.	190008	191138 & 191139
191097	Armature Thrust Washer, 1/64" thick	As Req'd.	BT108	115-125	60 & D.C.	190009	191251 & 191375
191098	Armature Thrust Washer, .015" thick	As Req'd.	BT110	200-220	60 & D.C.	190010	191232 & 191233
**	Field Coils Complete	1	BT112	230-250	60 & D.C.	190011	191232 & 191233
190303	Field Core	1	BT127	100-110	25 & 33-1/3	190008	191138 & 191365
190563	Field Coil Retainer	2	BT147	100-110	40 & 60	190008	190890 & 191140
191141 } 191142 }	End Covers Complete, Must be ordered in pairs	1	BT158	115-125	40 & D.C.	190009	191161 & 191234
190780	Brush Tube with Insulation	1					
195869	Brush Tube with Insulation and Lead	1					
195548	Carbon Brush	2					
196861	Brush Spring	2					
192930	Brush Cap	2					
50518	Brush Tube Set Screw	2					
190304	C.E. Cover Bearing Cap	1					
190977	Core Shield	1					
335	Core Shield Fastening Screw	2					
50517	End Cover Screws	2					
190074	Grease Cup Wick	2					
190075	Grease Cup Spring	2					
191010	Motor Pulley with Set Screw	1					
460	Motor Pulley Set Screw	1					
191050	Motor Bracket	1					
134	Motor Bracket Screw, to Machine	1					
168	Motor Bracket Screw, to Motor	1					
190651	Terminal Board	1					
50520	Insert Screw	1					
329	Terminal Board Fastening Screw	2					
50513	Terminal Screw	2					
190978	Terminal Cover	1					
335	Terminal Cover Fastening Screw	2					
190559	Lead Bushing	1					
190982	Lead with Male Plug, 11" Long	1					
191054	Lead with Male Plug, 10" Long	1					
191137	Idle Lever Complete	1					
190268	Idle Lever Only	1					
190095	Idle Pulley	1					
50516	Idle Pulley Screw	1					
1654	Idle Pulley Screw Nut	1					
190445	Idle Pulley Screw Washer	2					
190877	Idle Pulley Spring	1					
701	Idle Lever Hinge Screw	1					

(1) Must be ordered in pairs

## ELECTRICAL PARTS OTHER THAN MOTOR PARTS

PART NO.	DESCRIPTION	QUANTITY
191191	Line Lead, BT7 to BT92 Motors	1
190280	Line Lead, BT7 to BT92 Motors	1
190202	Connecting Plug, BT7 to BT92 Motors	1
190430	Connecting Plug BT7 to BT92 Motors	1
190317	Motor Lead Complete BT7 to BT92 Motors	1
190984	Line Lead BT107 to BT192 Motors	1
190986	Controller Lead, for BT107 to BT192 Motors	1
190988	Controller Lead, for BT107 to BT192 Motors	1

\*\*See Listing Under Catalog Number

(1256)

(Insert in Form 20596)

PRINTED  
IN U.S.A.



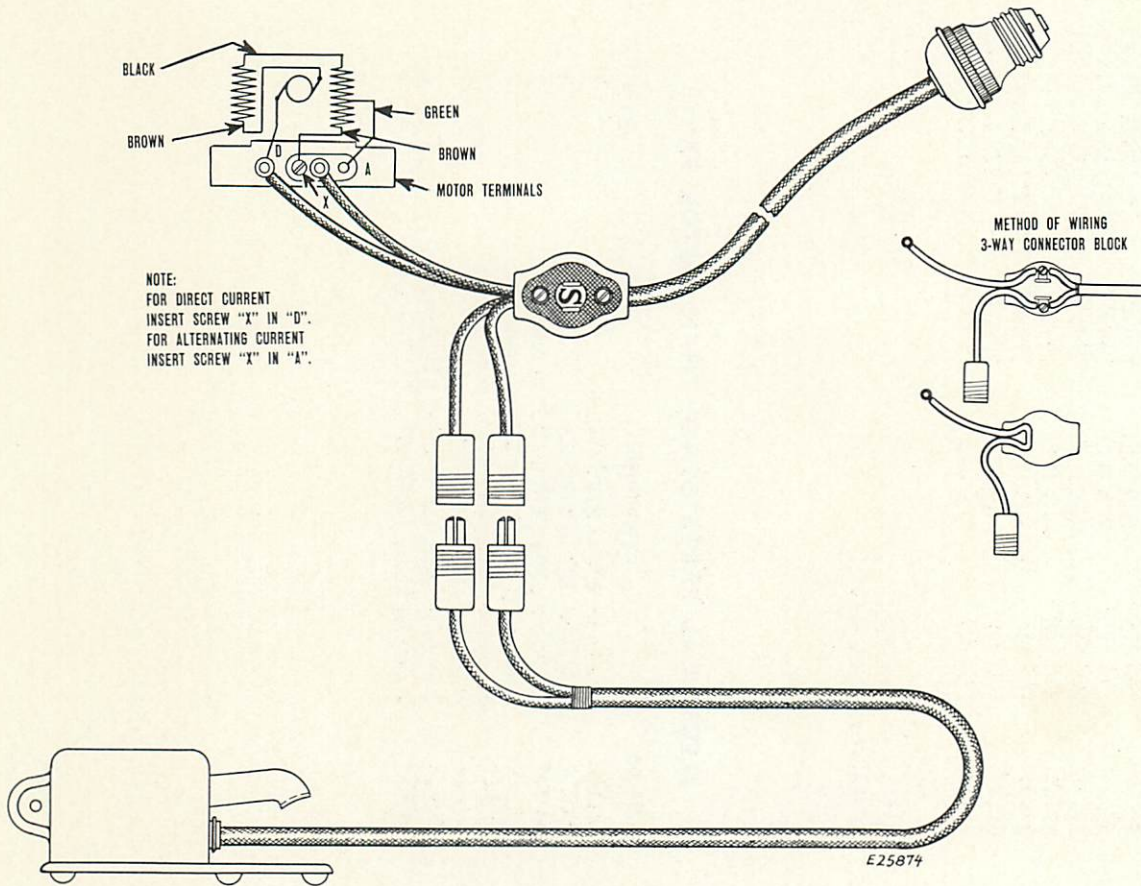


Fig. 3. Wiring Diagram for BT7 to BT92 Motors for Foot Control

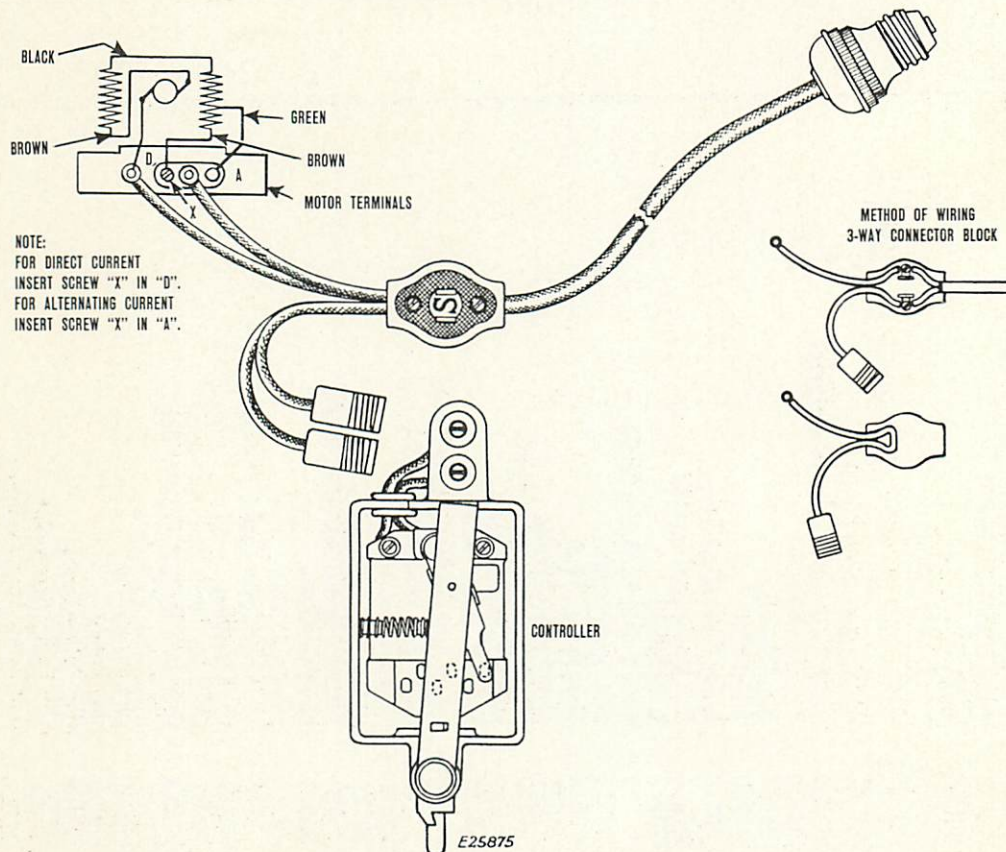


Fig. 4. Wiring Diagram BT7 to BT92 Motors on Classes 99 and 128 Machines in Portable Cases with Knee Control



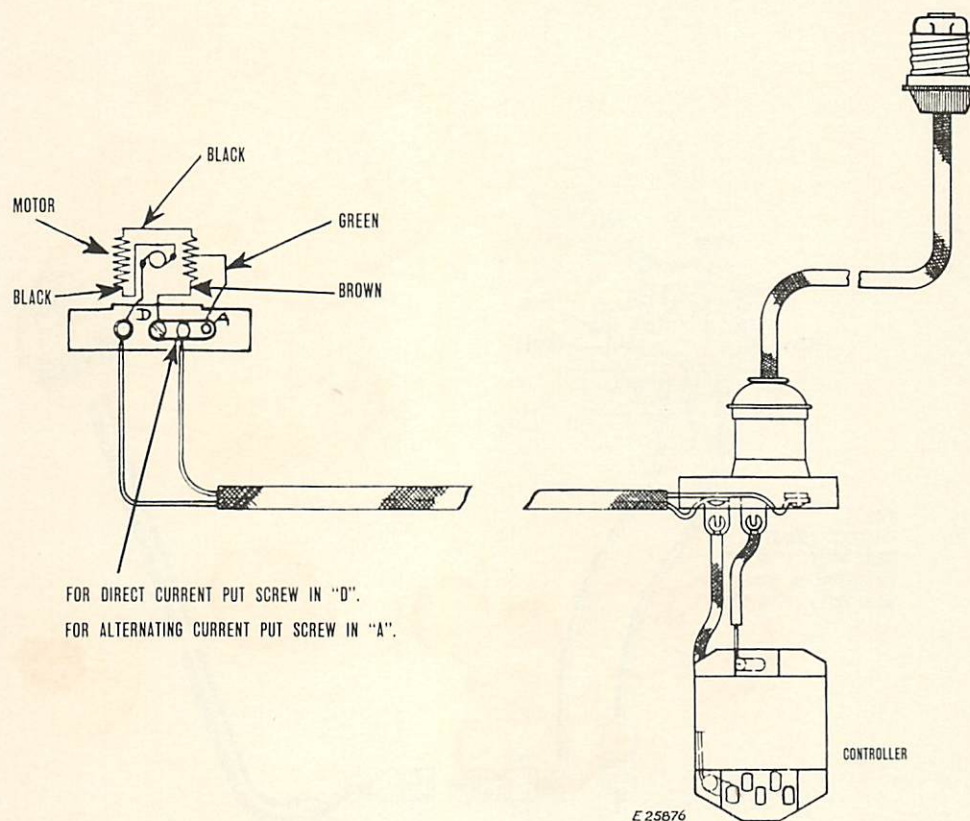


Fig. 5. Wiring Diagram for BT7 to BT92 Motors with Hand Control

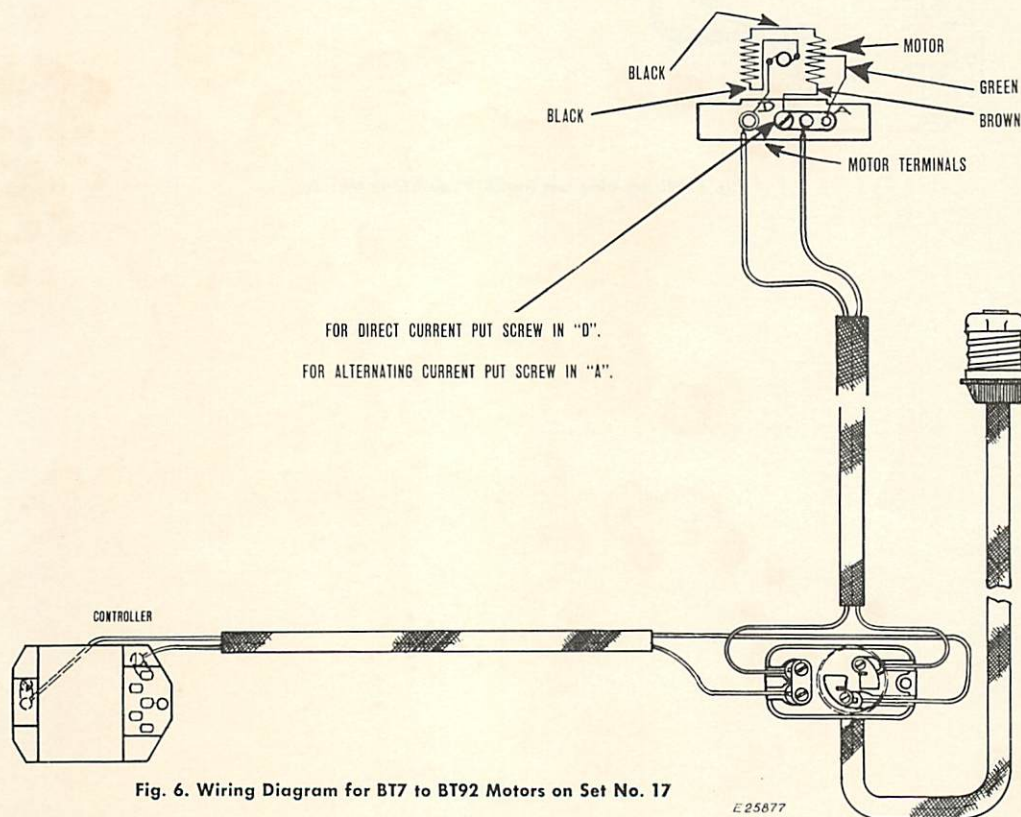


Fig. 6. Wiring Diagram for BT7 to BT92 Motors on Set No. 17

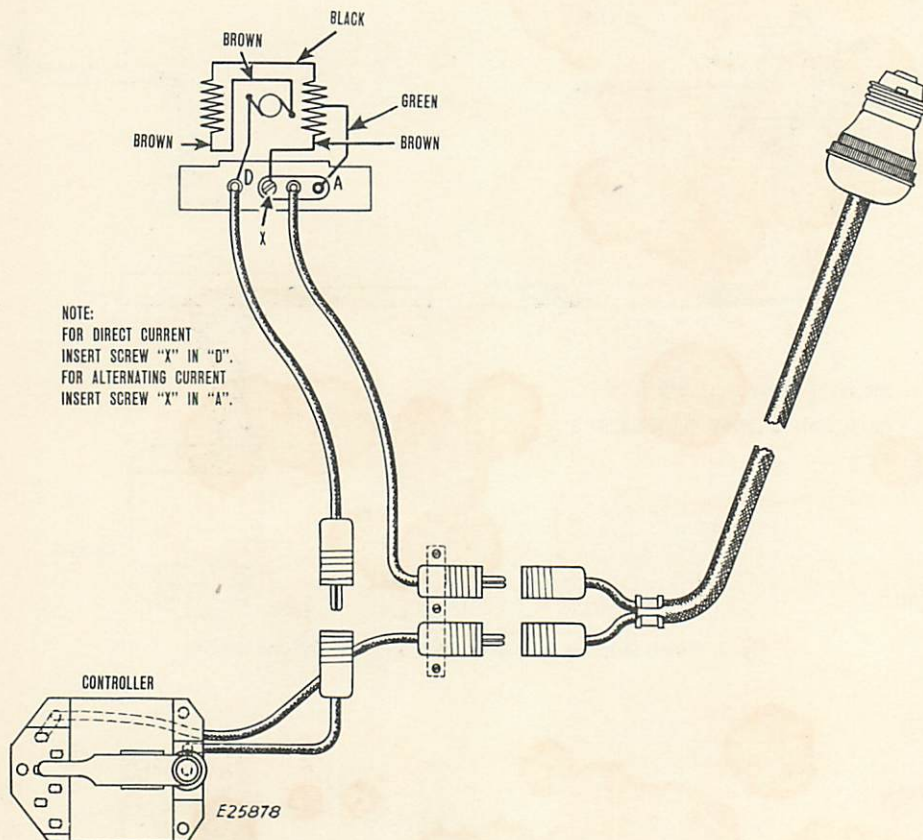


Fig. 7. Wiring Diagram for BT107 to BT192 Motors



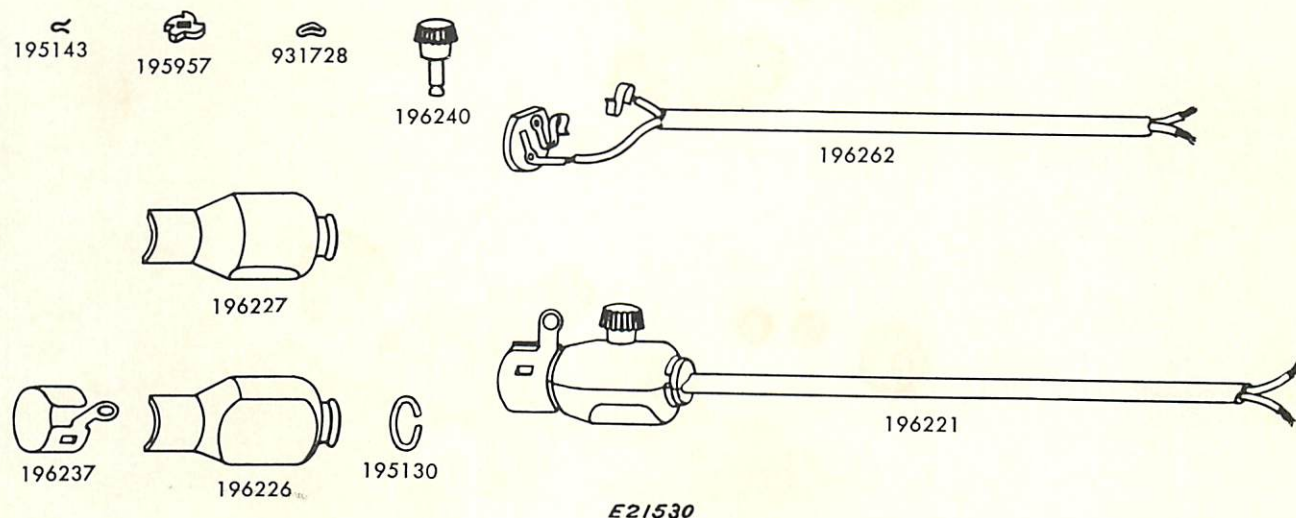
SINGER LIGHT WITH LEAD FOR CLASSES 301 AND 401  
FAMILY SEWING MACHINES

The SINGER Light with lead for Classes 301 and 401 Machines consists of a socket with mounting bracket made to fasten to the arm of the machine, and to be covered with a die cast shade and lens holder which is a part of the sewing machine itself.

The socket contains a switch for turning the light off and on and has a lead with two conductors terminating in stripped ends. These stripped ends are connected to corresponding stripped ends on the wiring harness (See Part 4, Section 4, Page 5) and are fastened by means of solderless wire connectors.

The socket and switch assembly is held together by means of a snap ring at the lead end and the spring mounting bracket at the socket end. The two halves of the socket are so arranged that, when clamping together, serrations in the slotted lead exit form a strain relief for the lead itself. Care should be taken when assembling or disassembling the switch socket to be sure that these serrations grip the insulating jacket of the lead cord.

Service Parts Chart and Service Parts List are shown below.



## CAT. NO. 196221 LIGHT WITH LEAD

Part No.	Description	Quantity
196221	Light Complete (less lamp)	1
196262	Disc with Springs, Lead and Spring Contact	1
196226	Socket Body, Lower Half	1
196240	Switch Cap with Insert P-5056	1
931728	Switch Cap Spring Washer	1
195143	Switch Cap Snap Ring	1
195957	Rotating Contact with Cam and Insulation	1
196227	Socket Body, Upper Half	1
195130 R	Socket Body Snap Ring	1
196237	Socket Body Clamp	1

**S4 SINGER LIGHT WITH SINGLE BREAK SWITCH KEY MECHANISM  
FOR USE WITH FAMILY SEWING MACHINES**

The S4 Light with lead for Family Sewing Machines consists of a socket with mounting bracket made to fasten to the arm of the machine. A shade with a reflector and lens fastens to the socket with shade holders.

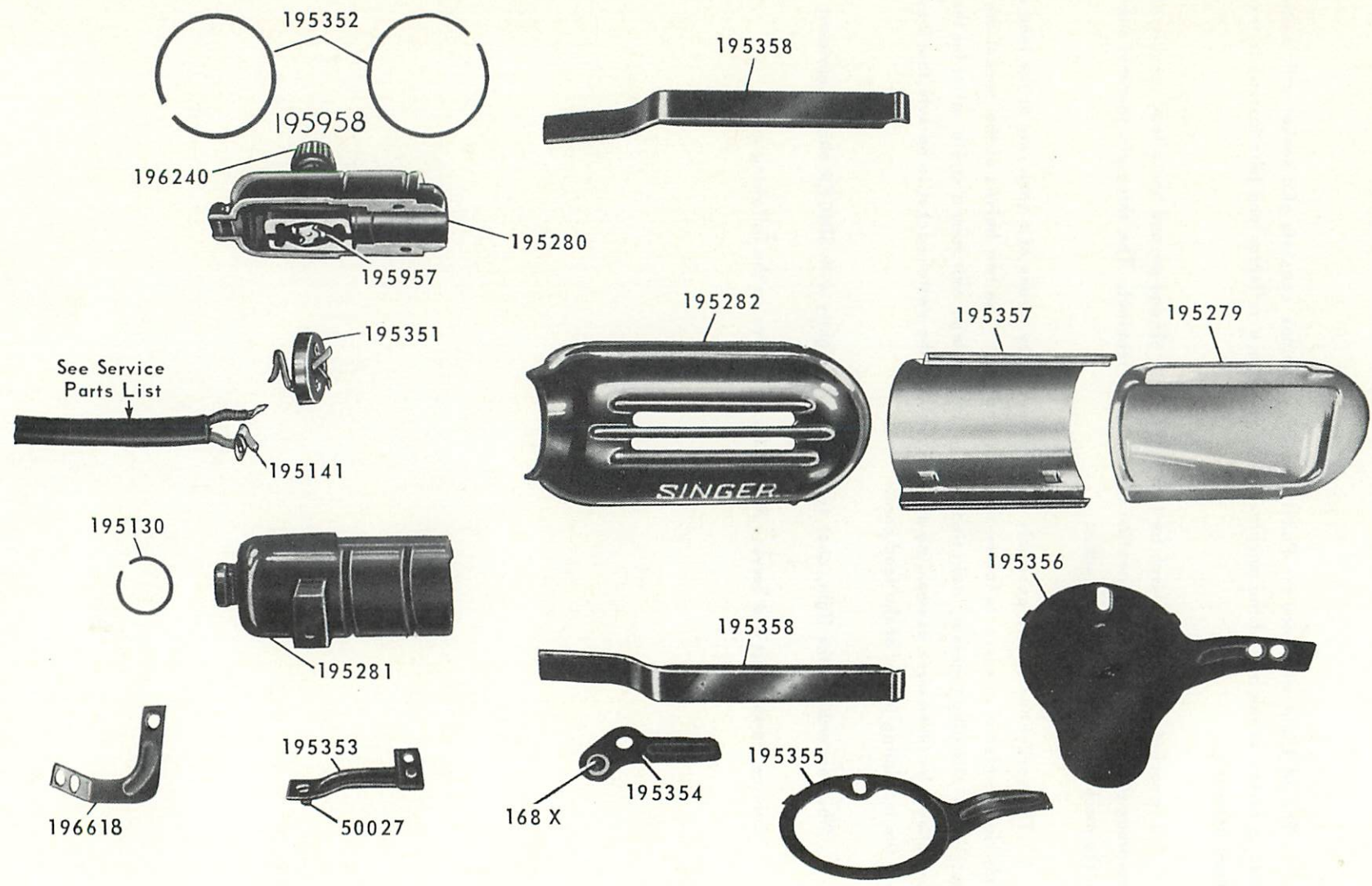
The socket contains a switch for turning the light off and on, and has a lead terminating either in a two-prong plug or eyelets for connection to a three-pin terminal. The three-pin terminal may be mounted on the machine or on the motor bracket.

The socket and switch assembly is held together by means of a snap ring at the lead end, and two body rings which also serve to fasten the shade holders. The two halves of the socket are so arranged that, when clamping together, serrations in the slotted lead exit form a strain relief for the lead itself. Care should be taken when assembling or disassembling the switch socket to be sure that these serrations grip the insulating jacket of the lead cord.

When assembling the light, coat spring contacts lightly with SINGER Motor Lubricant.

Service Parts Chart and Service Parts List are shown on the following page.

S4 SINGER LIGHT WITH SINGLE BREAK SWITCH KEY MECHANISM  
PARTS ILLUSTRATIONS





## PARTS LIST S4 SINGER LIGHT WITH SINGLE BREAK SWITCH KEY MECHANISM

Part No.	Description	Quantity
*195289	Light Complete (less lamp) For Nos. 15, 66, 127, 128, 191, and 201-23 Machines with Motors, Arm Slotted for Light Bracket	1
*195293	Light Complete (less lamp) For Nos. 15, 66, 127, 128 and 191 Machines without Motors, Arm Slotted	1
195292	Light Complete (less lamp) For No. 128 Machine with Motor, Arm Slotted	1
195296	Light Complete (less lamp) For No. 128 Machine Without Motor, Arm not Slotted	1
195290	Light Complete (less lamp) For No. 99 Machine with Motor, Drilled for Bracket	1
195294	Light Complete (less lamp) For No. 99 Machine without Motor, Arm Drilled	1
195291	Light Complete (less lamp) For Nos. 15, 66 and 127 Machines with Motor, Arm not Slotted	1
195295	Light Complete (less lamp) For Nos. 15, 66 and 127 Machines without Motor, Arm not Slotted	1
196122	Light Complete (less lamp) For Nos. 15, 66, 115 and 127 Machines with Three-way Connector Block, Arm not Slotted	1
196123	Light Complete (less lamp) For 66-6 Machine on Library Cabinet Table Set No. 20, Arm not Slotted	1
Ser. 46475	Light Complete (less lamp)	1
Ser. 49956	Light Complete (less lamp) For 99K Machine	1
Ser. 49835	Light Complete (less lamp) To be used in place of 192530 for replacement purposes	1
Ser. 49834	Light Complete (less lamp) For Nos. 15, 66, 115 and 127 Machines for electric plain table	1
*196619	Light Complete (less lamp) For Nos. 206K, 306 and 319 Machines	1
Ser. 200540	Light Complete (less lamp) For No. 99 Machine without Motor, Arm Drilled	1
*195352	Socket Body Snap Ring (large)	2
*195958	Socket Body, Upper Half, with Switch Key	1
*196240	Switch Key with Insert	1
195957	Rotating Contact with Cam and Insulation	1
*195280	Socket Body, Upper Half	1
195351	Disc with Spring	1
195141	Spring Contact, Lead End	1
*195130	Socket Body Snap Ring (small)	1

## PARTS LIST S4 SINGER LIGHT WITH SINGLE BREAK SWITCH KEY MECHANISM

(Continued)

*195281	Socket Body, Lower Half	1
*195358	Shade Holder	2
*195282	Shade	1
195357	Reflector	1
195279	Lens	1
*195349	Disc with Spring, Lead and Contact	1
	For use with Light Nos. 195289, 195290, 195292, 195291	
*195350	Disc with Spring, Lead and Contact	1
	For use with Light Nos. 195293, 195296, 195294, 195295	
*196126	Lead with Disc, Springs and Plug	1
	For use with Light Nos. 196122, Ser.49835, Ser.200540	
*196127	Lead with Disc, Springs and Plug	1
	For use with Light No. 196123	
Ser. 49331	Disc with Springs, Lead and Terminals	1
	For use with Light Nos. Ser. 46475, Ser. 49956	
Ser. 49964	Disc with Springs, Lead and Terminals	1
	For use with Light No. Ser. 49834	
*196621	Disc with Spring, Lead and Terminals	1
	For use with Light No. 196619	
*195353	Bracket - For use with Light Nos. 195289, 195293, Ser. 46475, Ser. 49834	1
195356	Bracket - For use with Light Nos. 195292, 195296, Ser. 49835	1
195354	Bracket - For use with Light Nos. 195290, 195294, Ser. 49956, Ser. 200540	1
195355	Bracket - For use with Light Nos. 195291, 195295, 196122, 196123	1
*196618	Bracket - For use with Light No. 196619	1
50027	Bracket Screw (to fasten to machine)	1
	For use with Nos. 195353, 196618	
168 R	Bracket Screw (to fasten to machine)	1
	For use with No. 195354	
*140738	Bracket Screw (to fasten to socket)	2

\* When ordering state color or finish.

**S4 SINGER LIGHT WITH DOUBLE BREAK SWITCH KEY MECHANISM  
FOR USE WITH FAMILY SEWING MACHINES**

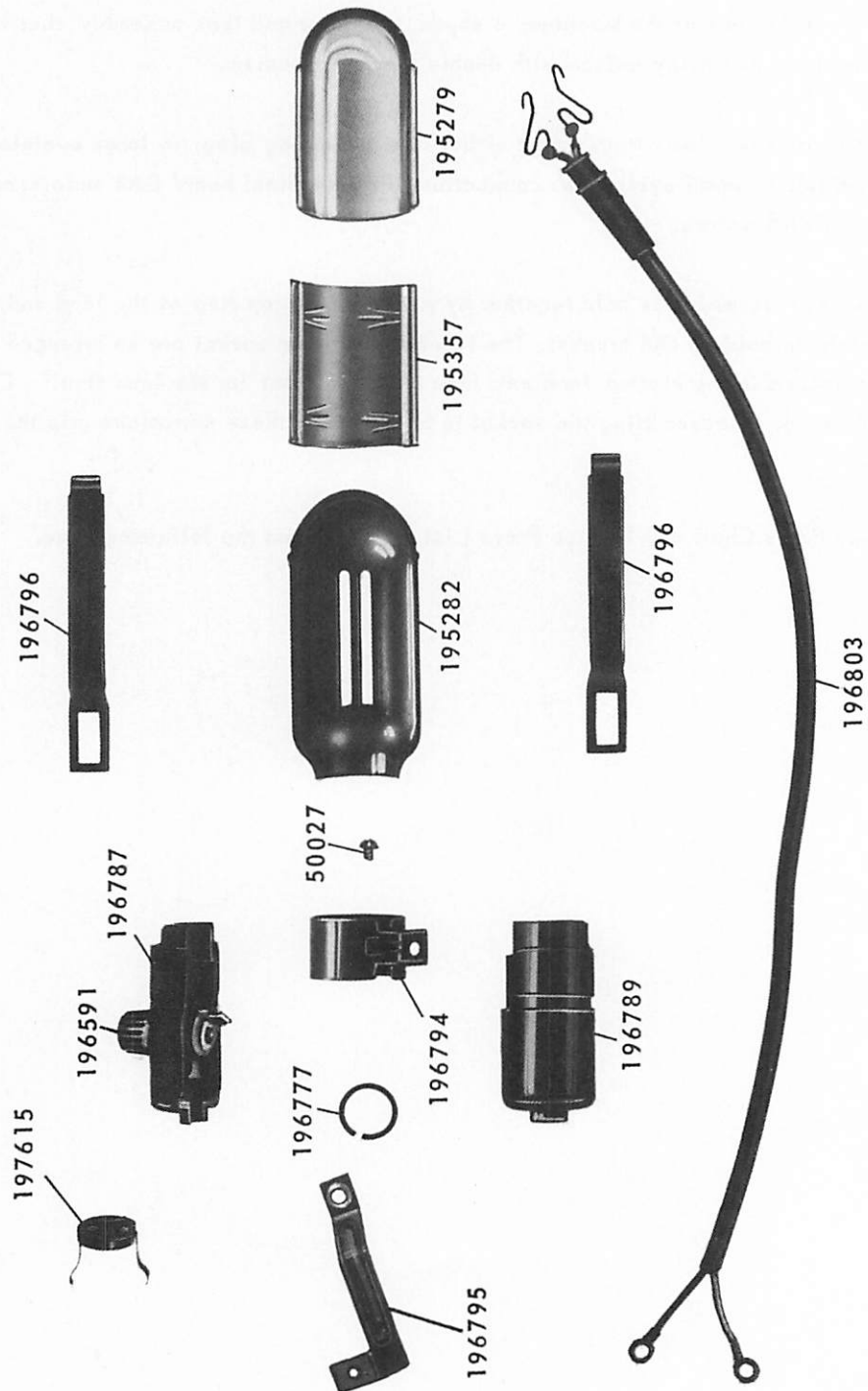
The S4 Light with lead for Family Sewing Machines consists of a socket with mounting bracket made to fasten to the arm of the machine; a shade, reflector and lens assembly that fastens to the socket with shade holders; and a key switch with double break mechanism.

The socket has a lead terminating either in a two-prong plug; in large eyelets for connection to a three-pin terminal; in small eyelets for connection to the terminal board BA4 motors; or in stripped ends for connection to BZK5 motors.

The socket assembly is held together by means of a snap ring at the lead end, and a clamp which also fastens shade holders and bracket. The two halves of the socket are so arranged that, when clamping together, serrations in the slotted lead exit form a strain relief for the lead itself. Care should be taken when assembling or disassembling the socket to be sure that these serrations grip the insulating jacket of the lead cord.

Service Parts Chart and Service Parts List are shown on the following page.

S4 SINGER LIGHT WITH DOUBLE BREAK SWITCH KEY MECHANISM  
PARTS ILLUSTRATIONS



## PARTS LIST FOR S4 LIGHT WITH DOUBLE BREAK SWITCH KEY MECHANISM

Part No.	Description	Quantity
*196572	Light Complete (less lamp) For Nos. 15, 66, 127, 128 and 201 Machines, slotted for bracket, connected to 3-pin terminal	1
*196576	Light Complete (less lamp) For Nos. 15, 66, 127, 128 and 201 Machines, slotted for bracket, connected to line socket	1
196573	Light Complete (less lamp) For No. 99 Machine, drilled for bracket, connected to 3-pin terminal	1
196577	Light Complete (less lamp) For No. 99 Machine, drilled for bracket, connected to line socket	1
196574	Light Complete (less lamp) For Nos. 15, 66, 127 and 201 Machines, not slotted, connected to 3-pin terminal	1
196578	Light Complete (less lamp) For Nos. 15, 66, 127 and 201 Machines, not slotted, connected to line socket	1
196575	Light Complete (less lamp) For No. 128 Machine, not slotted, connected to 3-pin terminal	1
196579	Light Complete (less lamp) For No. 128 Machine, not slotted, connected to line socket	1
196859	Light Complete (less lamp) For No. 206K Machine, connected to line socket	1
196860	Light Complete (less lamp) For 206K Machine, connected to 3-pin terminal	1
*197383	Light Complete (less lamp) For Nos. 15, 66, 128 and 201 Machines, slotted for bracket, with BZ Motor	1
197384	Light Complete (less lamp) For No. 99 Machine, slotted for bracket, with BZ Motor	1
*197385	Light Complete (less lamp) For No. 306 Machine, slotted for bracket, with BZ5 Motor.	1
*197212	Light Complete (less lamp) For No. 206K Machine with BAK4 Motor	1
*197209	Light Complete (less lamp) For Nos. 15, 66, 127, 128 and 201 Machines, slotted for bracket, with BAK4 Motor	1
197210	Light Complete (less lamp) For No. 99 Machine, drilled for bracket, with BAK4 Motor	1

## PARTS LIST FOR S4 LIGHT WITH DOUBLE BREAK SWITCH KEY MECHANISM

(Continued)

Part No.	Description	Quantity
*197211	Light Complete (less lamp) For Nos. 15, 66, 127 and 201 Machines, not slotted, with BAK4 Motor	1
197728	Light Complete (less lamp) For 99K52 Machine	1
*196786	Actuating Switch with Light Body	1
*196787	Light Body, Upper Half	1
196587	Actuating Plate with Shaft	1
196588	Actuating Cam	1
*196591	Switch Cap	1
*140698	Switch Cap Fastening Screw	1
196589	Actuating Cam Spring	1
197615	Contact Base Complete	1
*196789	Light Body, Lower Half	1
*196777	Light Body Snap Ring	1
*196794	Light Body Clamp	1
*195282	Shade	1
195357	Reflector	1
195279	Lens (Blue Glass)	1
*196796	Shade Holder	2
*196803	Lead Complete with Spring Contacts For use with Light Nos. 196572, 196573, 196574, 196575, 196860	1
*196613	Lead Complete with Spring Contacts and Plug For use with Light Nos. 196576, 196577, 196578, 196579 196859	1
*197386	Lead Complete with Spring Contacts For use with Light Nos. 197383, 197384, 197385	1
*197218	Lead Complete with Spring Contacts For use with Light Nos. 197212, 197209, 197210, 197211	1
*196795	Bracket – For use with Light Nos. 196572, 196576, 197383, 197209	1
*196805	Bracket – For use with Light Nos. 196573, 196577, 197384, 197210	1**
*196804	Bracket – For use with Light Nos. 196574, 196578, 197211	1**
*196807	Bracket – For use with Light Nos. 196575, 196579	1**
*196806	Bracket – For use with Light Nos. 196859, 196860, 197385, 197212	1**
197729	Bracket – For use with Light No. 197728	1
* 50027	Bracket Fastening Screw (to machine)	1

\* When ordering state color or finish

\*\* Not Illustrated



**CAT. S1 SPOTLIGHT WITH LEAD FOR  
FAMILY SEWING MACHINES**

The Cat. S1 Spotlight with lead, for family sewing machines, consists of a socket with integral shade, and a mounting bracket made to fasten to the arm of the machine.

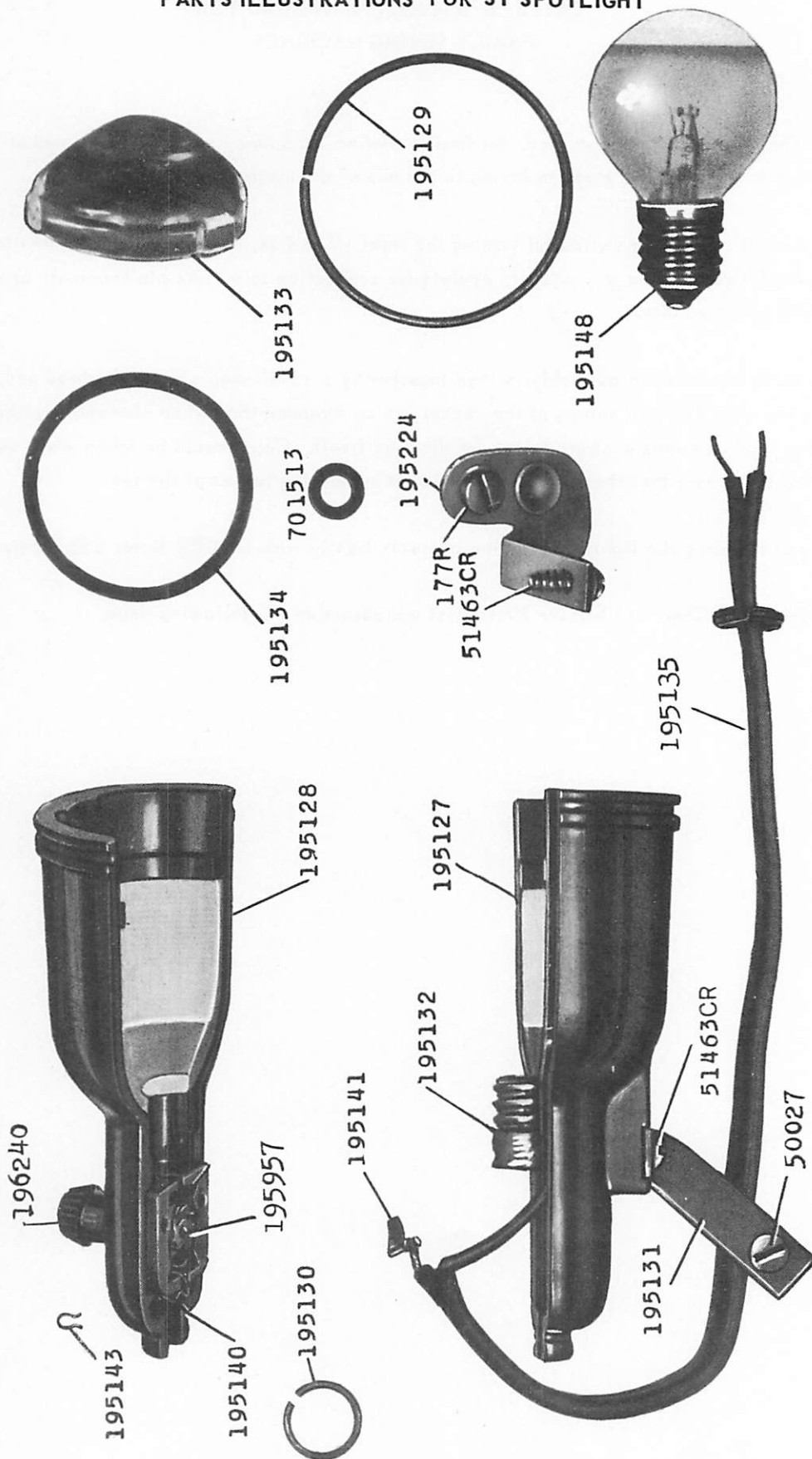
The socket contains a switch for turning the light off and on, and has a lead terminating either in a two-prong plug for connection to a socket; eyelets for connection to a three-pin terminal; or stripped ends for connection to BZ motors.

The socket and switch assembly is held together by a small snap ring at the lead end, and a larger ring at the lamp end. The two halves of the socket are so arranged that, when clamped together, serrations in the slotted lead exit form a strain relief for the lead itself. Care should be taken when assembling the switch socket to be sure that these serrations grip the insulating jacket of the lead.

When assembling the light, coat spring contacts lightly with SINGER Motor Lubricant.

Service Parts Chart and Service Parts List are shown on the following page.

PARTS ILLUSTRATIONS FOR S1 SPOTLIGHT



PARTS LIST FOR S1 SPOTLIGHT  
(Single Break Mechanism)

Part No.	Description	Quantity
195126	Spotlight Complete	1
	For No. 66-8 Machine, arm slotted for bracket	
195144	Spotlight Complete	1
	For No. 128-8 Machine	
195233	Spotlight Complete	1
	For 99-23 Machine, arm drilled for bracket	
195246	Spotlight Complete	1
	For 99-23 Machine, arm neither drilled nor slotted	
Ser. 47473	Spotlight Complete	1
	For 66SV4, 66SV6, 66SV8, 66SV13 Machines, arms slotted	1
Ser. 47871	Spotlight Complete, arm slotted	1
Ser. 47937	Spotlight Complete	1
	For Machines less motors, arm neither drilled nor slotted	
195963	Spotlight Complete for connection to 3-pin terminal	1
	For 15 Machine, arm slotted for bracket	
195980	Spotlight Complete	1
	For 15 and 66 Machines, with BZ21-8 Motor Outfit only	
196283	Spotlight Complete	1
	For 15 Machine, less motor, arm slotted	
196885	Spotlight Complete	1
	For Machine with RF4-8 Motor, arm slotted for bracket	
195127	Spotlight Body, Lower Half	1
195128	Spotlight Body, Upper Half	1
195129	Spotlight Body Snap Ring (large)	1
195130	Spotlight Body Snap Ring (small)	1
195148	Spotlight Lamp (voltage as required)	1
195133	Spotlight Lens (blue glass)	1
195134	Spotlight Lens Tension Ring	1
195957	Spotlight Contact with Cam and Insulation	1
195140	Spotlight Switch Spring Contact, (lamp side)	1
195132	Spotlight Lamp Socket	1
195141	Spotlight Switch Spring Contact, (lead side)	1
196240	Spotlight Switch Key	1
931868	Switch Key Spacing Washer	1
195143	Switch Key Snap Ring	1
195135	Spotlight Cord with Socket and Spring (lead side)	1
	For use with Spotlight Nos. 195126, 195233, 195246, 195980, and 196885	
195145	Spotlight Cord Complete with Plug, Lamp Socket and Spring (lead side) For use with Spotlight Nos. 195144, Ser. 47473	1
197613	Cord Line Plug	1
876363	Cord Connector (For use with Spotlight No. 195246 only)	2
Ser. 47872	Spotlight Cord with Socket and Spring (lead side)	1
	For use with Spotlight No. Ser. 47871	
Ser. 48130	Spotlight Cord with Socket, Spring and Plug	1
	For use with Spotlight No. Ser. 47937	
195965	Spotlight Cord Complete	1
	For use with Spotlight No. 195963	
196286	Spotlight Cord Complete	1
	For use with Spotlight No. 196283	
195131	Bracket - For use with Spotlight Nos. 195126, Ser. 47473, Ser. 47871, 196885, and Ser. 200043 (see below)	1

PARTS LIST FOR S1 SPOTLIGHT  
(Continued)

Part No.	Description	Quantity
195147	Bracket - For use with Spotlight No. 195144	1**
195224	Bracket - For use with Spotlight Nos. 195233, 196646 (see below)	1**
195191	Bracket - For use with Spotlight Nos. 195246, Ser. 47937	1**
195964	Bracket - For use with Spotlight Nos. 195963, 196283	1**
51463	Bracket Screw (To fasten to Spotlight)	1
50027	Bracket Screw (To fasten to Machine)	1
	For use with Bracket Nos. 195131, 195964	
51326	Bracket Screw (To fasten to machine)	1
	For use with Bracket No. 195144	
177	Bracket Screw (To fasten to Machine)	1
	For use with Bracket No. 195224	
195194	Bracket Clamping Spring	1
	For use with Bracket No. 195191	
140341	Bracket Screw - For use with Bracket No. 195191	1
196625	Bracket Screw Retaining Washer	1
	For use with Bracket No. 195224	

S1 SPOTLIGHT  
(Double Break Mechanism)

Parts are the same as those for the single break mechanism with the following exceptions:

Part No.	Description	Quantity
196646	Spotlight Complete	1
	For 99 Machine with BZ Motor, drilled for bracket	
199075	Lead Complete	1
196586	Spring Contact (Use also with Ser. 200043)	2
199062	Actuating Switch with Body, Upper Half	1
199063	Spotlight Body, Upper Half	1
196587	Actuating Plate with Shaft (Use also with Ser. 200043)	1
199064	Actuating Cam	1
196591	Switch Cap (Use also with Ser. 200043)	1
140698	Switch Cap Fastening Screw (Use also with Ser. 200043)	1
199065	Switch Cap Plug	1
196589	Actuating Cam Spring (Use also with Ser. 200043)	1
199066	Contact Base Complete	1
199073	Spotlight Body, Lower Half	1
Ser. 200043	Spotlight Complete	1
	For Classes 15, 66, 127, 128 and 201 Machines with BZ Motors, arm slotted for bracket	
196699	Lead Complete	1
196700	Actuating Switch with Spotlight Body, Upper Half	1
196701	Spotlight Body, Upper Half	1
196588	Actuating Cam	1
196592	Contact Base Complete	1
196608	Lamp Socket Complete	1
196702	Spotlight Body, Lower Half	1

\*\* Not Illustrated

**ELECTRICAL OUTFITS FOR SCHOOLS, INCLUDING SCHOOL TABLES**

Section 1—Family Sewing Machines with Ground Connection

Section 2—Electrical Outfits for School Tables Nos. 409 and 410

Section 3—Electrical Outfits for School Tables Nos. 411 to 416 inclusive

Section 4—Electrical Outfits for School Tables Nos. 417, 418 and 419

Section 5—Electrical Outfits for 64" School Tables

Section 6—Conversions of School Tables

**CHART SHOWING TABLE OUTFITS USED IN SCHOOL TABLES**

Table No.	Type of Outfit	Table Outfit No. for Machines Listed				Refer to	
		** 15-91 66-16 201-2	** 306W25	*** 15-102 15-126 66-17 191J10 201-5 201 J25 301-4 306-26 319-3 401-4	*** 301-3	Sect. No.	Page No.
409	Non-Grounded	196671				2	1
409	Grounded	196681				2	8
409	Safety Switch	196688				2	16
410	Safety Switch				196928	2	22
411	Safety Switch	196688	196688			3	1
412	Safety Switch	196688	196688			3	1
413	Safety Switch	196688	196688			3	1
414	Safety Switch				196928	3	3
415	Safety Switch				196928	3	3
416	Safety Switch				196928	3	3
417	Safety Switch			197175		4	1
418	Safety Switch			197175		4	1
419	Safety Switch			197175		4	1

\*\* These Machines must be ordered special for use in School Tables, refer to Section listed for ordering instructions.

\*\*\* These Machines are equipped with the correct Wiring Harness, to connect to the Table Outfit, as listed below:

Machine 15-102 equipped with Wiring Harness 197177  
Machine 15-126 equipped with Wiring Harness 197177  
Machine 66-17 equipped with Wiring Harness 197177  
Machine 191J10 equipped with Wiring Harness 197177  
Machine 201-5 equipped with Wiring Harness 197177  
Machine 201J25 equipped with Wiring Harness 197177  
Machine 301-3 equipped with Wiring Harness 196929  
Machine 301-4 equipped with Wiring Harness 197176  
Machine 306-26 equipped with Wiring Harness 197177  
Machine 319-3 equipped with Wiring Harness 197177  
Machine 401-4 equipped with Wiring Harness 197708

NOTE: Where no outfit number is shown in the above chart for a machine, that machine is not normally used on the table indicated. To convert the table to use the desired machine refer to Part 3, Section 6.

CHART SHOWING COMPONENT SUB-ASSEMBLIES OF TABLE OUTFITS

Table Outfit No.	Junction Box Complete No.	Controller Complete No.	Machine Lead with Bed Extension Plate No.	Safety Switch Assembled No.
196671	196672	196698	196696	197153 ** **
196681	196682	196698	196685	
196688	196682	196698		
196928	196682	196897		
197175	196682	197179		

\*\* Safety Switch Assembled included with Machine.

PARTS REQUIRED TO CONVERT STANDARD MACHINES TO SCHOOL TABLE MACHINES ON SCHOOL TABLES 409 TO 416 INCLUSIVE

Machine	Drill and Tap Machine Bed	Safety Switch Assembled No.	New Motor No.	New Three-Pin Terminal No.	For Instructions See Sect. 6, Page
15-91	Yes	197153 (1)	BA5-8	197152	10
66-16	Yes	197153 (1)			11
201-2	Yes	197153 (1)		197151	10
301-1	No	196929			8
301-2	No	196929	BA5-8		8
306-25	No	197153 (1)			11
319-2	No	197153 (1)			11
401-1	No	196929			12

(1) Safety Switch assembled No. 197153 is a component part of the Table Outfit, No. 196688, on the 409, 411, 412, and 413 School Tables.

PARTS REQUIRED TO CONVERT STANDARD MACHINES TO SCHOOL TABLE MACHINES ON TABLES 417, 418 AND 419

Convert Machine From	Convert Machine To	Drill and Tap Machine Bed	Wiring Harness No.	New Motor No.	New Three-Pin Terminal No.	For Instructions See Sect. 6, Page
15-91	15-102	Yes	197177	BA5-8	197152	11
66-16	66-17	Yes	197177			11
201-2	201-5	Yes	197177		197151	11
301-1	301-4 (1)	No	197176			9
301-2	301-4 (1)	No	197176	BA5-8		9
306-25	306-26	No	197177			11
319-2	319-3	No	197177			11
401-1	401-4	No	197708			12

(1) Machine Cradle No. 170112 is required in addition to parts shown above.

**NOTE:**

All grounded and safety switch outfits were manufactured with grounded flat-prong three-pin terminals until early in 1955 and since then with grounded round-prong three-pin terminals. The grounded flat-prong terminals (male and female) will no longer be supplied. All replacements of grounded terminals, either male or female, must be made with ground round-prong three-pin terminals and both male and female halves must be ordered. Refer to Section 2, Page 9 for terminal Numbers and instructions for making replacements.



**FAMILY SEWING MACHINES WITH GROUND CONNECTION  
FOR USE WITH STUDENT ELECTRIC SETS**

In many cases where family sewing machines are sold to schools, it is required in the contract that the metal parts of the sewing machine be connected to ground potential when the machine is in use. In order to satisfy this requirement grounded outfits have been developed to provide this ground connection.

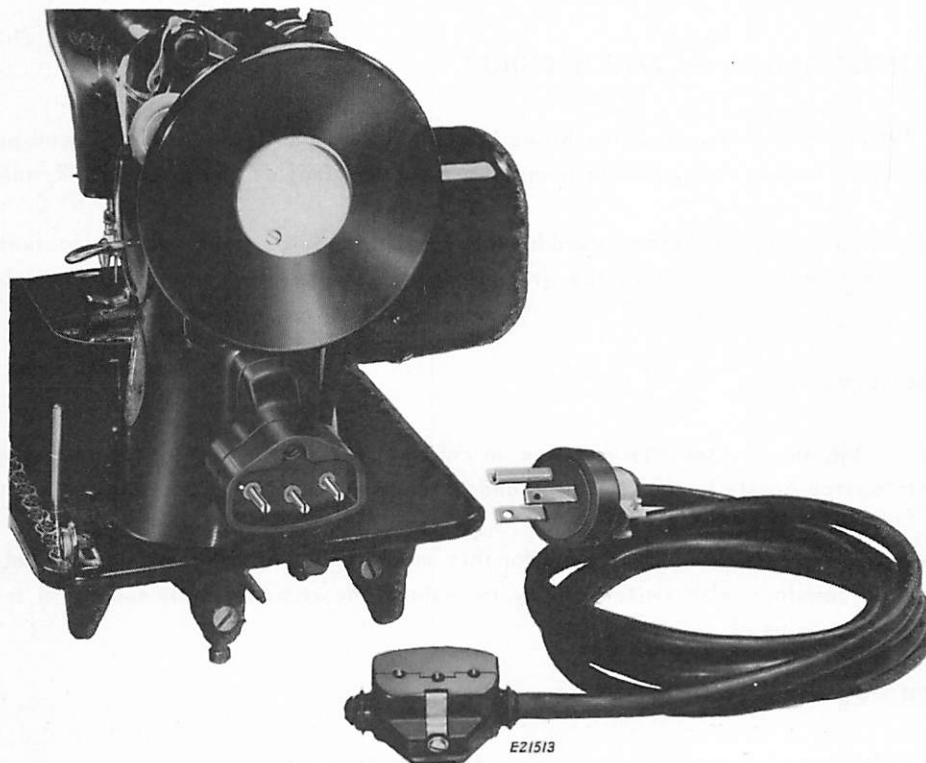


Fig. 1. Showing Electrical Connections for Grounding Machine

These electrical outfits employ a 3-pin terminal with ground connection, a 3-wire line lead and a 3-prong line plug. Ground connection to the machine is made through a bronze contact held in the male half of the 3-pin terminal by the mounting screw. This contact makes connection with a similar contact in the female half, which is connected to the green wire in the line lead.

Until early in 1955, these outfits were produced with a flat prong 3-pin terminal, and since then, with a round prong 3-pin terminal. The flat prong 3-pin terminals are no longer supplied. All replacements of 3-pin terminals, either male or female half, must be made with round prong grounded 3-pin terminals, and both male and female halves must be replaced. See Part 3, Section 2, pages 9 and 10 for instructions for making these replacements.

In schools having 3-wire systems with 3-prong grounded electrical outlets, the 3-prong plug on the end of the line lead is plugged into the wall or floor electrical outlet. In schools having 2-wire systems with 2-prong electrical outlets, adaptor No. 885960 must be used. The adaptor is plugged into the wall or floor electrical outlet and the pigtail lead emerging from the adaptor is fastened under the screw fastening the outlet box cover to the outlet. The 3-prong plug is then plugged into the adaptor. **IT IS IMPORTANT THAT THE PIGTAIL LEAD WIRE BE CONNECTED UNDER THE OUTLET BOX COVER SCREW TO COMPLETE THE GROUND WIRE CIRCUIT.**

**CLASSES 66, 306 and 319 MACHINES WITH BA MOTOR**

The BA5 motor is fitted with a round prong grounded 3-pin terminal which grounds the metal parts of the machine when used with line lead 196312 on cabinet sets, or foot controller with line lead 196313 on portable sets.

**CLASSES 15-91, 15-125, 191J14, and 221-1 MACHINES**

Line lead 196314 is used for these machines in cabinet sets and includes male round prong grounded 3-pin terminal to replace the standard male round-pin 3-pin terminal on the machine. Regular motors are used.

Controller with line lead 196315 is used for these machines in portable sets and includes male round prong grounded 3-pin terminal to replace the standard male round-pin terminal on the machine. Regular motors are used.

**CLASS 201-2 MACHINES**

Line lead 196316 is used for this machine in cabinet sets and includes male round prong grounded 3-pin terminal with switch cavity to replace the standard male round-pin terminal on the machine. Regular motor is used.

Controller with line lead 196317 is used for this machine in portable sets and includes male round prong grounded 3-pin terminal with switch cavity to replace the standard male round pin terminal on the machine. Regular motor is used.

**ORDERING MACHINES**

Machines with ground connection should be ordered as follows:

**FOR CABINET SETS**

66-16	machine with BA5-8 motor and line lead 196312
306W25	machine with BA5-8 motor and line lead 196312
319W2	machine with BA5-8 motor and line lead 196312
15-91	machine with line lead 196314
15-125	machine with line lead 196314
191J14	machine with line lead 196314
201-2	machine with line lead 196316

**FOR PORTABLE SETS**

66-16, 306W25, 319W2	machine with BA5-8 motor and controller with line lead 196313
15-91, 15-125, 191J14	machine with controller with line lead 196315
221-1	machine with controller with line lead 196315
201-2	machine with controller with line lead 196317

**ALL ORDERS for above machines should carry note "ROUND PRONG 3-PIN TERMINAL WITH GROUND CONNECTION."**

To order repair parts for line leads see Part 4, Section 16.

To order repair parts for controllers see Part 6, Section 1.

## WIRING DIAGRAMS

Except for the ground connection, which is made through a green wire in the line lead, the color code for wiring Machines 15-91, 66-16, 201-2 and 221-1 is the same as regular. These wiring diagrams are shown in Figs. 2 and 3.

WIRING DIAGRAM FOR "BA" MOTOR  
WITH MOLDED FOOT CONTROLLER 3 PIN TERMINAL  
S-4 SINGERLIGHT

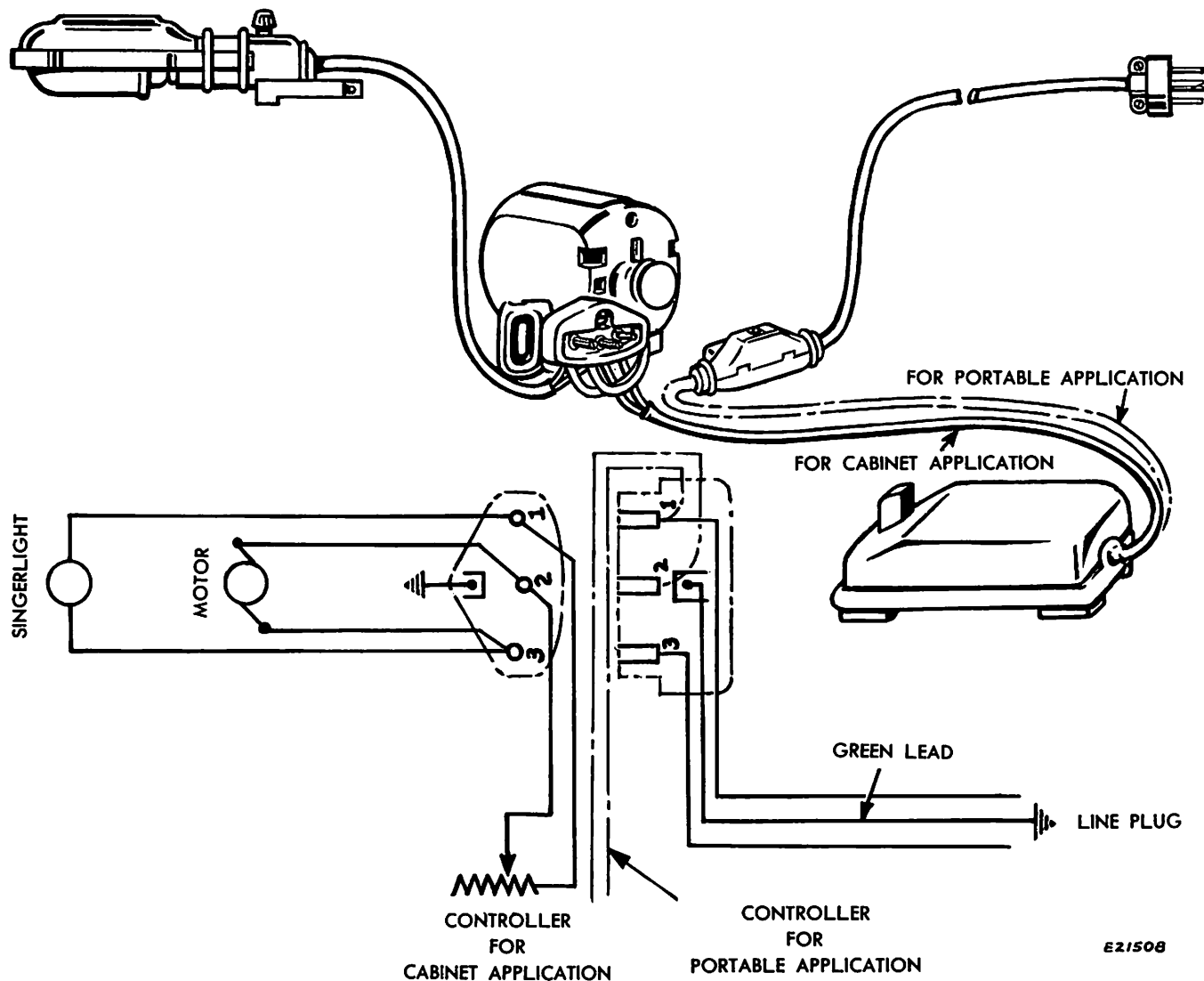


Fig. 2. Wiring Diagram for Grounded Machine 66-16 with BA Motor, Molded Foot Controller, 3-Pin Terminal and S4 SINGERLIGHT

WIRING DIAGRAM FOR GROUNDED  
15-91, 221-1, 201-2 FAMILY  
SEWING MACHINES

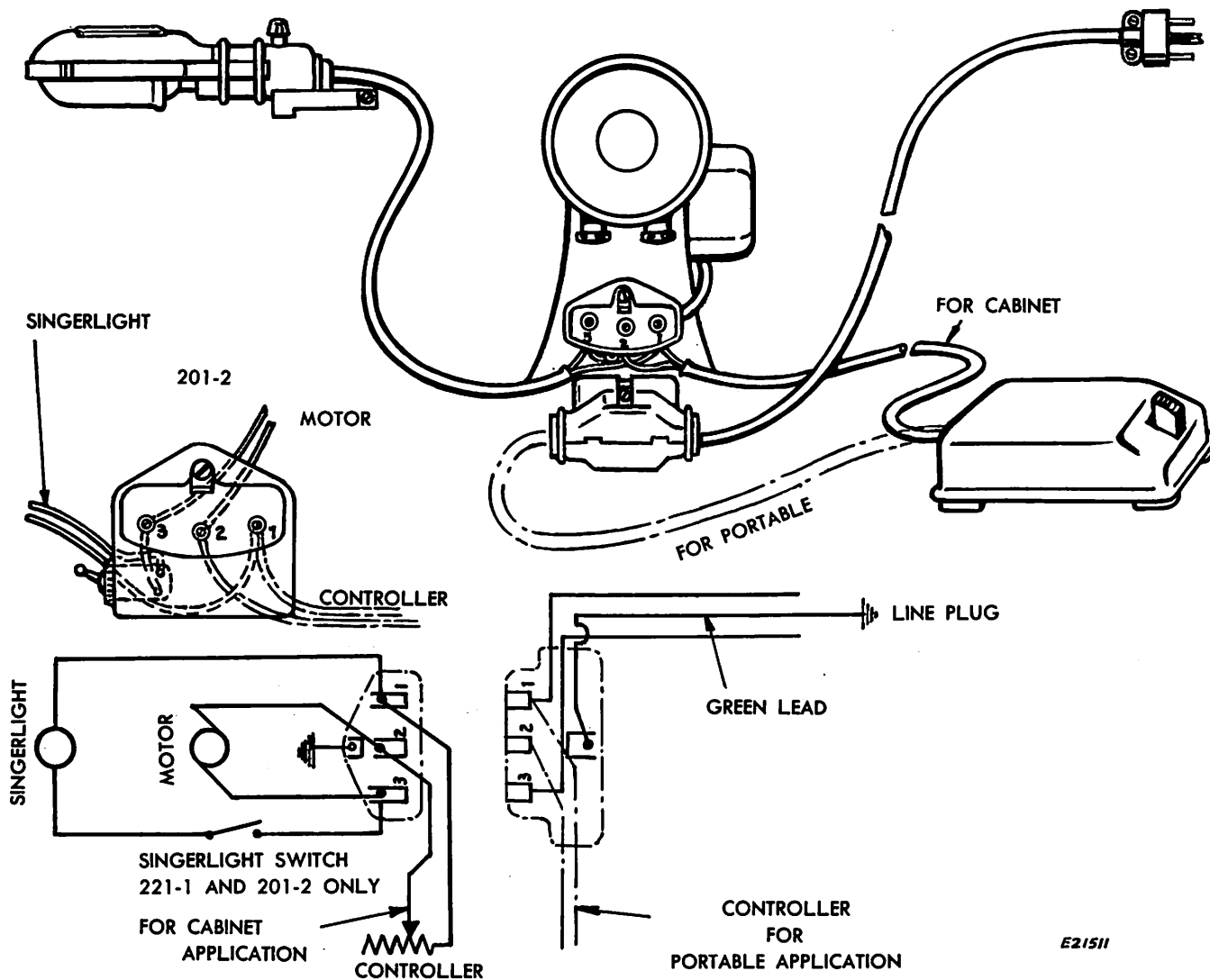


Fig. 3. Wiring Diagram for Grounded Machines 15-91, 221-1 and 201-2

Safety of the ground connection may be easily checked with a 2-cell metal case flashlight, as shown in Fig. 4

#### FLASHLIGHT TEST FOR SEWING MACHINE WITH GROUND CONNECTION

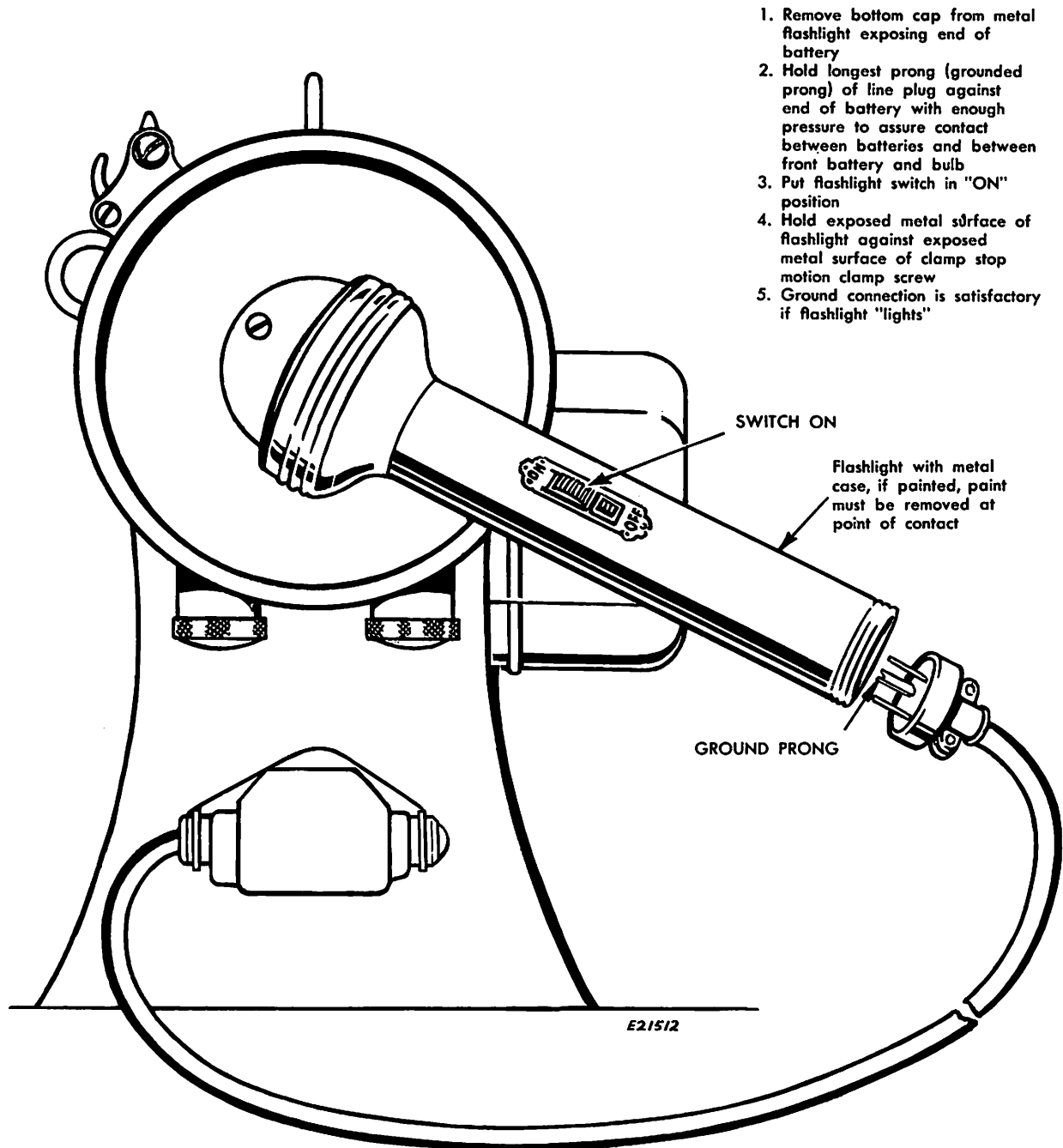


Fig. 4. Testing Ground Connection with 2-cell Metal Case Flashlight

#### PARTS LIST AND SERVICE PARTS CHART

Parts list and service parts charts will be found in PART 4.

**ELECTRICAL OUTFITS FOR SCHOOL TABLES NOS. 409 AND 410**

(School Table No. 409 is obsolete, replaced by School Tables Nos. 411, 412 and 413 and School Table No. 410 is obsolete, replaced by School Tables Nos. 414, 415 and 416.)

See Pages 1 to 21 for School Table 409 and Pages 22 to 25 for School Table 410.

School Table 409, shown in Fig. 1, is a table with two wells at opposite corners to take two drop head machines so that a flush work surface is presented when the machines are lowered into the wells. The table has two small drawers on each side at the corners. This table is equipped with knee control using treadle type controllers and knee lever mechanisms. Electrical outfits for this table were available in three varieties:

**Non-Grounded (without safety switch) 196671 (Formerly Serial 49865)**

**Grounded (without safety switch) 196681 (Formerly Serial 49866)**

**Grounded Safety Switch 196688 (Formerly Serial 49867)**

Machines Classes 15, 66 and 201 were used in these tables. For descriptions, parts charts, parts lists and wiring diagrams of the various outfits see following pages of this section:

**Non-Grounded Outfit, see Pages 1 to 7.**

**Grounded Outfit, see Pages 8 to 15.**

**Grounded Safety Switch Outfits, see Pages 16 to 21.**

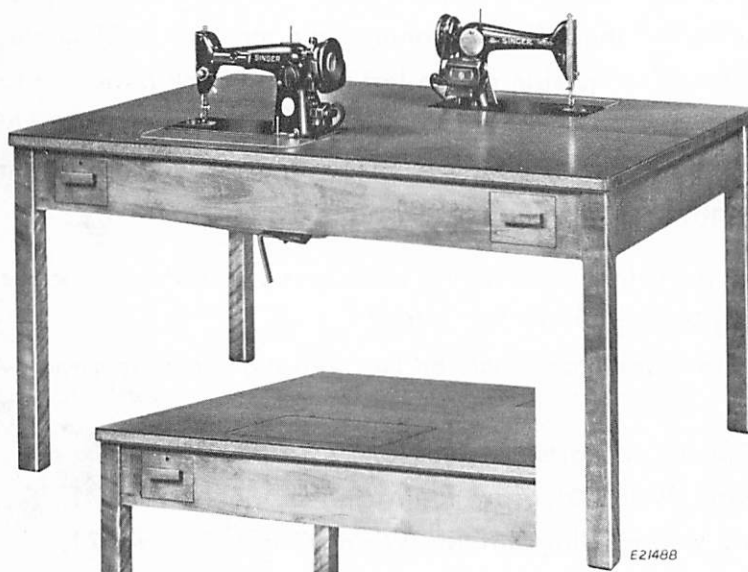


Fig. 1. School Table No. 409

**NON - GROUNDED OUTFIT NO. 196671 (without safety switch), see illustration on Page 3.**

(Obsolete, replaced by Grounded Safety Switch Outfit No. 196688)

This is a regular electrical outfit similar to that ordinarily supplied for family type sewing machines except specifically designed for the School Table.

**MACHINES** should be ordered as regular Class 15, 66 or 201 except with bed drilled and tapped for Bed Extension Plate 96869.

**TABLE OUTFIT** should be ordered as No. 196671 which includes:

One No. 196672—Junction Box with Two Conductor Line Lead and Plug

Two No. 196696—Machine Lead with Bed Extension Plate

Two No. 196698—Controller Complete



**NON-GROUNDED OUTFIT NO. 196671 FOR NO. 409 SCHOOL TABLE**

The Junction Box mounts on the underside of the table top at the center. This includes a box, cover, two conductor line lead and plug (for connection to a wall or floor electric outlet), two electric outlet receptacles into which the machine leads are plugged, two jumper leads to connect the two receptacles in parallel and four wood screws to fasten the junction box to the table.

The Machine Lead with Bed Extension Plate includes a bed extension plate, a two conductor lead with a three-pin terminal, female half, at one end (which connects to the three-pin terminal, male half, on the motor or machine) and a two-pin plug on the other end (which plugs into the receptacle in the junction box) and two screws and washers to fasten the bed extension plate to the machine. The machine lead is threaded through a rubber bushing fitted in the round hole in the bed extension plate. This lead emerges from the machine well at the rear right corner through a slot in the top of the back panel.

The controller complete consists of a standard treadle type controller with two conductor lead. The controller fastens to the front panel of the table. The controller lead is threaded through a slot in the top of the left side panel of the machine well shield, at the front right corner of the well, along the outside of the left side and back panels, into the machine well again through a slot in the top of the back panel, at the rear right corner of the well, through the same bushing in the bed extension plate as the machine lead, and connected to the three-pin terminal, male half, on the motor or sewing machine.

For parts charts, parts lists, and wiring diagrams see following pages of this section.

Page 3, Showing Wiring Outfit No. 196671.

Page 4, Parts Chart and Parts List for No. 196696 Machine Lead with Bed Extension Plate.

Page 5, Parts Chart and Parts List for No. 196672 Junction Box.

Page 6, Schematic Wiring Diagram for Wiring Outfit No. 196671.

Page 7, Pictorial Wiring Diagram for Wiring Outfit No. 196671.

NON-GROUNDED OUTFIT NO. 196671 FOR NO. 409 SCHOOL TABLE

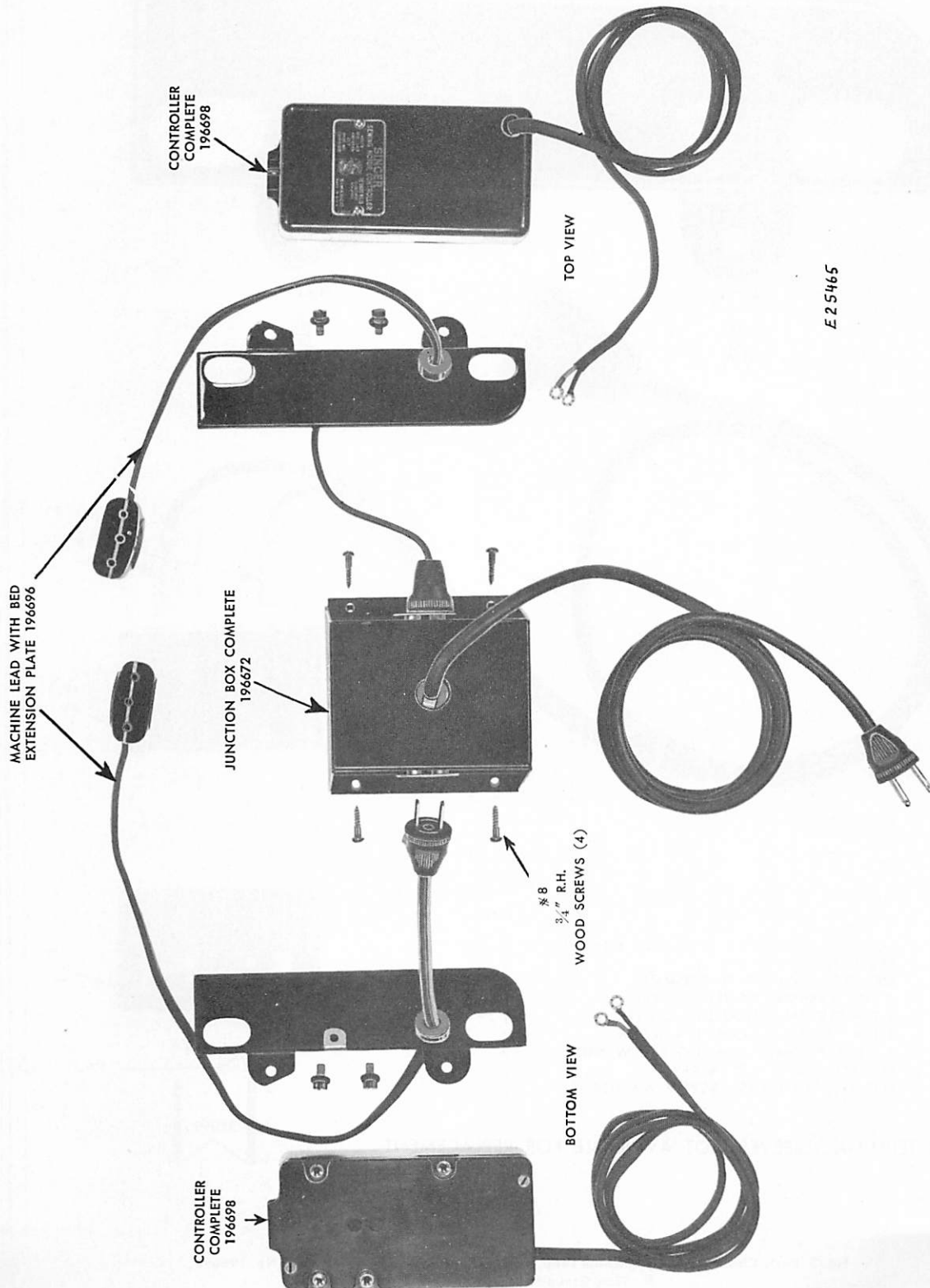
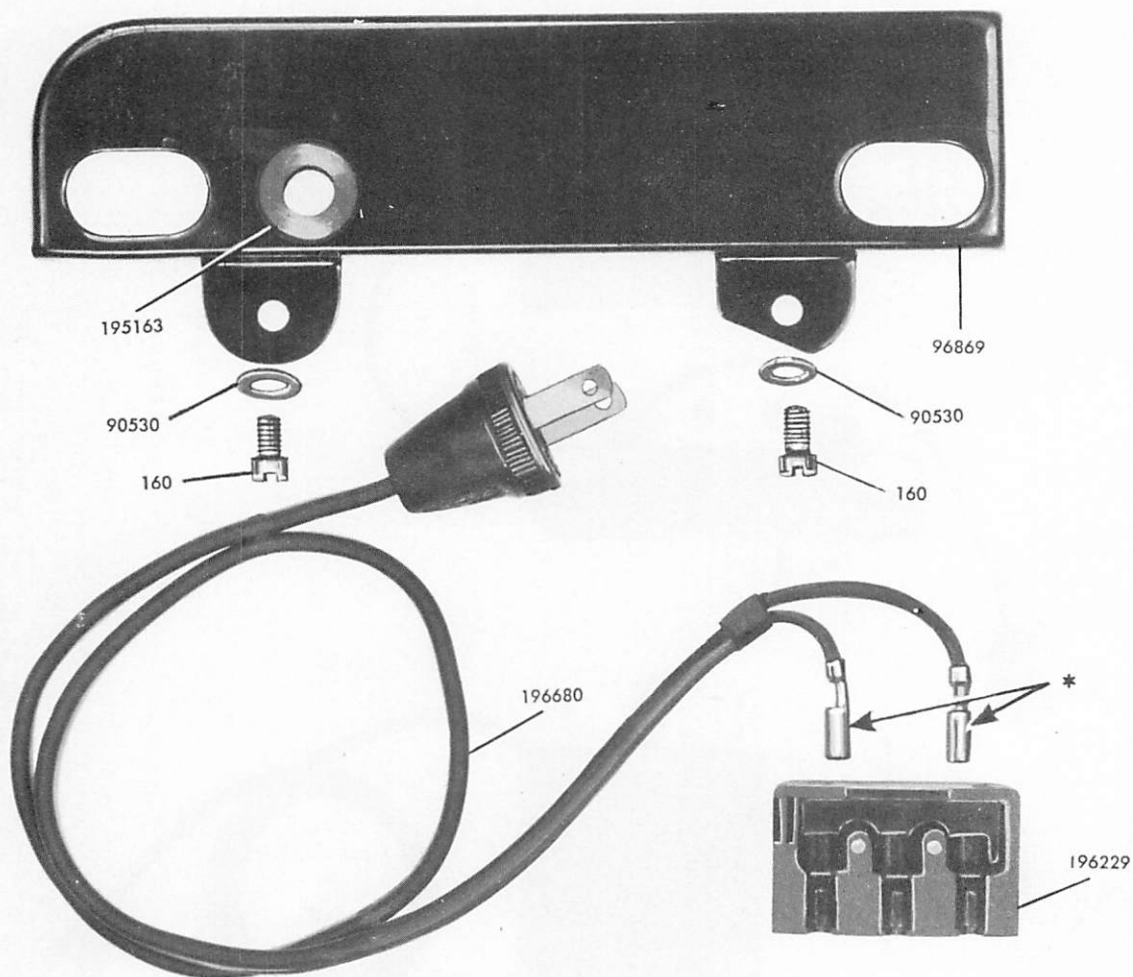


Fig. 2. Non-Grounded Outfit Complete No. 196671  
For No. 409 School Table

## NON-GROUNDED OUTFIT NO. 196671 FOR NO. 409 SCHOOL TABLE



PART NO.	DESCRIPTION	QUAN.
196680	MACHINE LEAD WITH PLUG AND SLEEVES	1
96869	BED EXTENSION PLATE	1
195163	BED EXTENSION PLATE GROMMET	1
196228	3 PIN TERMINAL HOUSING, UPPER	1
196229	3 PIN TERMINAL HOUSING, LOWER	1
51093	3 PIN TERMINAL CLAMPING SCREW	2
1768	3 PIN TERMINAL CLAMPING SCREW NUT	2
160	BED EXT. PLATE FAST. SCREW	2
90530	BED EXT. PLATE FAST. SCREW WASHER	2

\* 3-PIN TERMINAL SLEEVES NOT AVAILABLE FOR REPLACEMENT

E25469

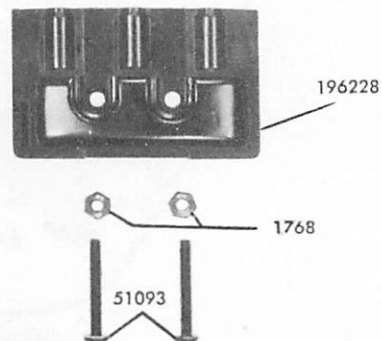
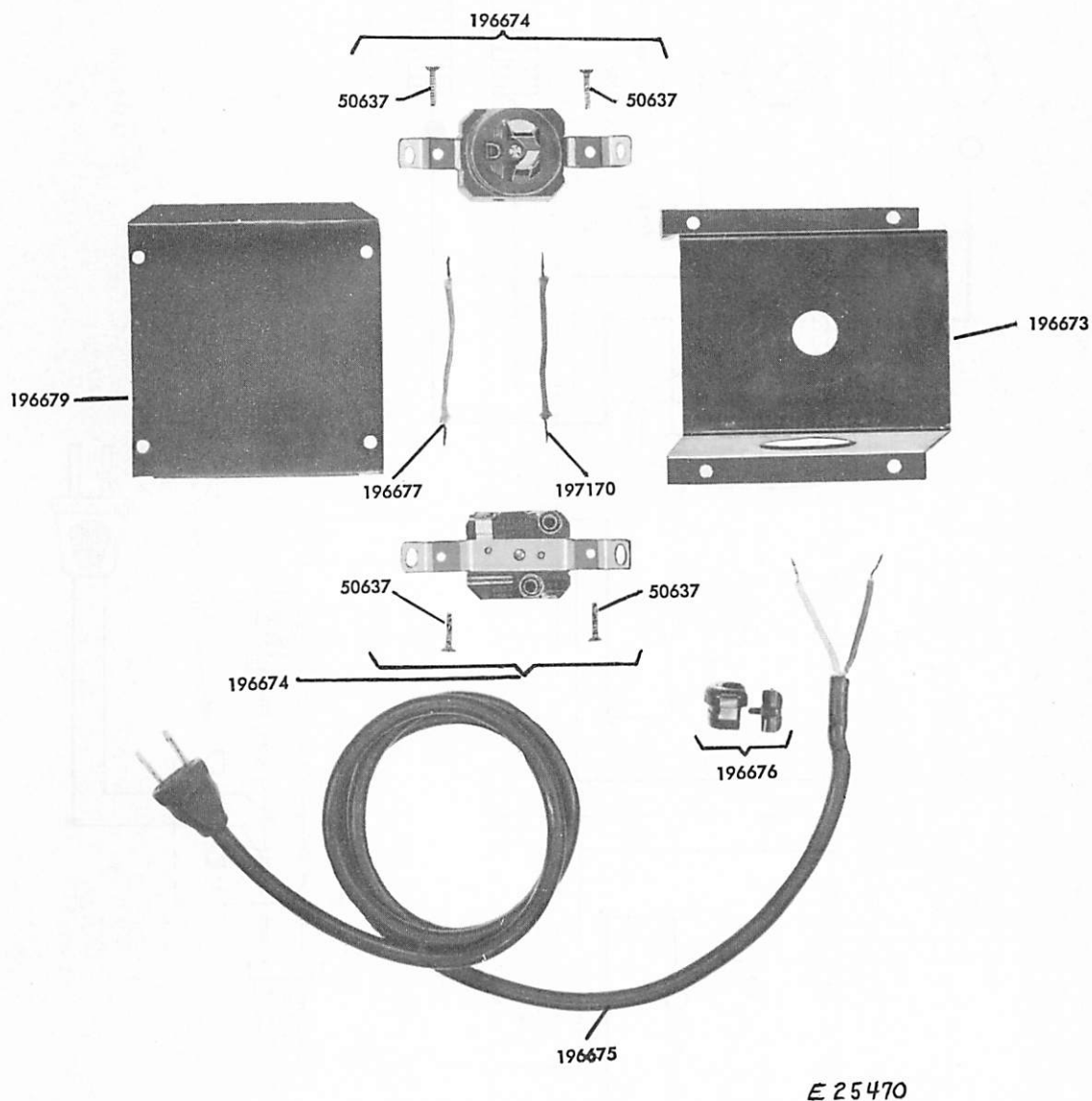


Fig. 3. Parts Chart Showing Machine Lead with Bed Extension Plate Complete No. 196696, for Non-Grounded Outfit No. 196671

## NON-GROUNDED OUTFIT NO. 196671 FOR NO. 409 SCHOOL TABLE



E 25470

Fig. 4. Parts Chart showing Junction Box Complete No. 196672 for Non-Grounded Outfit No. 196671

PART NO.	DESCRIPTION	QUANTITY
196673	Junction Box	1
196679	Junction Box Cover	1
196674	Receptacle with Mounting Screws	2
50637	Receptacle Mounting Screw	4
196676	Line Lead Strain Relief	1
196675	Line Lead with Plug	1
196677	Jumper Lead, Brown	1
197170	Jumper Lead, Black	1

NON-GROUNDED OUTFIT NO. 196671 FOR NO. 409 SCHOOL TABLE

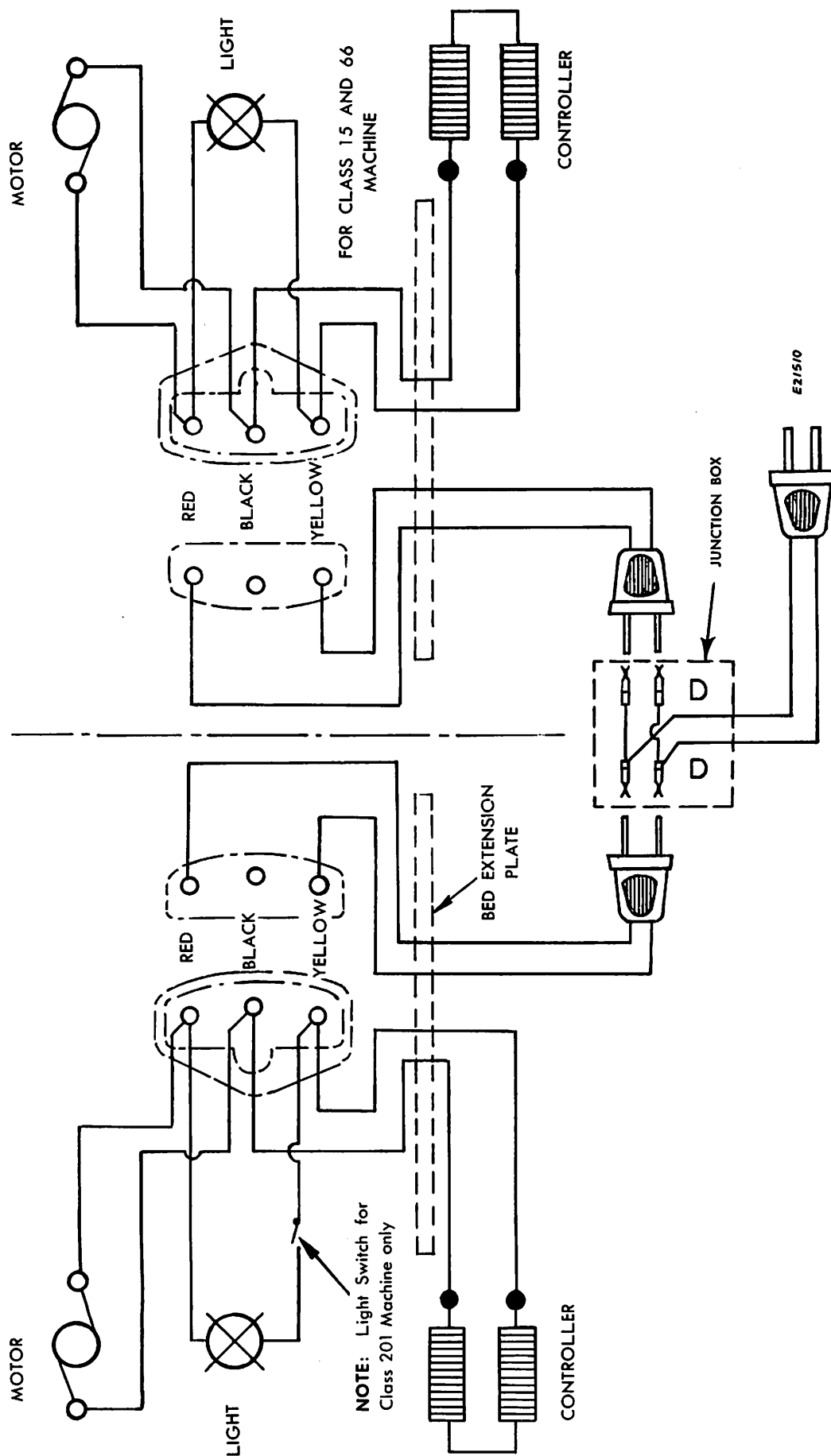


Fig. 5. Wiring Diagram for No. 196671 Non-Grounded Outfits for Classes 15, 66 and 201 Machines on School Table No. 409

NON-GROUNDED OUTFIT NO. 196671 FOR NO. 409 SCHOOL TABLE

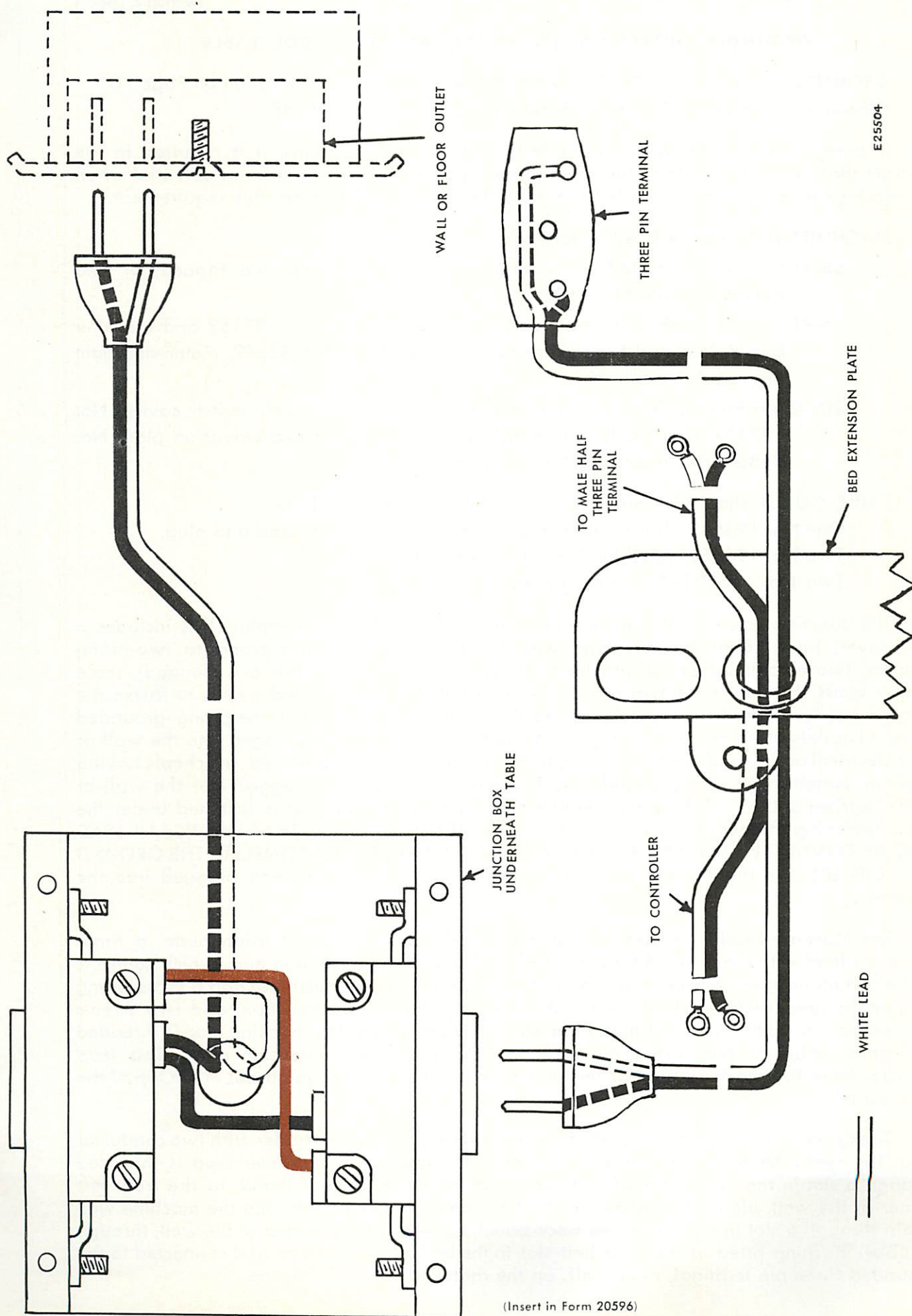


Fig. 6. Pictorial Wiring Diagram for No. 196671 Non-Grounded Outfit for Classes 15, 66 and 201 Machines on School Table No. 409



**GROUNDING OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE**

GROUNDING OUTFIT NO. 196681 (Without safety switch) see illustration on Page 10.  
(Obsolete, replaced by Grounded Safety Switch Outfit No. 196688.)

In many cases where sales are made to certain school systems, it is required in the contract that the metal parts of the sewing machine be connected to ground potential when the machine is in use. The grounded outfit has been designed to meet this requirement.

**MACHINES** should be ordered as follows:

- 66-16 machine with BA5 motor and machine bed drilled and tapped for bed extension plate No. 96869.
- 15-91 machine with male grounded three-pin terminal No. 197152 and machine bed drilled and tapped for bed extension plate No. 96869. Motor and light are regular.
- 201-2 machine with male grounded three-pin terminal with switch cavity, No. 197151, and machine bed drilled and tapped for bed extension plate No. 96869. Motor and light are regular.

**TABLE OUTFIT** should be ordered as No. 196681 which includes:

- One No. 196682—Junction Box with Three Conductor Line Lead and plug.
- Two No. 196685—Machine Lead with Bed Extension Plate
- Two No. 196698—Controller Complete

The Junction Box mounts on the underside of the table at the center. This includes a box, cover, three conductor line lead with three-prong plug, three-prong to two-prong adapter, two electric outlet receptacles (into which the machine leads are plugged), three jumper leads to connect the two receptacles in parallel and four wood screws to fasten the junction box to the table. In schools having three-wire systems with three-prong grounded electrical outlets, the three-prong plug on the end of the line lead is plugged into the wall or floor electrical outlet, and the three-prong to two-prong adapter is not used. In schools having two-wire systems with two-prong electrical outlets, the adapter is plugged into the wall or floor electrical outlet and the pigtail lead emerging from the adapter is fastened under the screw fastening the outlet box cover to the outlet. **IT IS IMPORTANT THAT THE PIGTAIL LEAD WIRE BE CONNECTED UNDER THE OUTLET BOX COVER SCREW TO COMPLETE THE GROUND WIRE CIRCUIT.** The three-prong plug on the end of the line lead is then plugged into the adapter.

The Machine Lead with Bed Extension plate includes a bed extension plate, a three conductor lead with a grounded three-pin terminal, female half, on one end (which connects to the grounded three-pin terminal, male half, on the motor or machine) and a three-prong plug on the other end (which plugs into the receptacle in the junction box) and two screws and washers to fasten the bed extension plate to the machine. The machine lead is threaded through a rubber bushing fitted in the round hole in the bed extension plate. This lead emerges from the machine well at the rear right hand corner through a slot in the top of the back panel.

The Controller Complete consists of a standard treadle type controller with two conductor lead. The controller fastens to the front panel of the table. The controller lead is threaded through a slot in the top of the left side panel of the machine well shield, at the front left corner of the well, along the outside of the left side and back panels, into the machine well again through a slot in the top of the back panel, at the right rear corner of the well, through a rubber bushing fitted in the rear belt slot in the bed extension plate and connected to the grounded three-pin terminal, male half, on the motor or sewing machine.

GROUNDING OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE

NOTE:

GROUNDING OUTFIT NO. 196681 was manufactured with a grounded flat-prong three-pin terminal. These flat-prong three-pin terminals will no longer be supplied. All replacement of three-pin terminals, either male or female, must be made with round-prong grounded three-pin terminals and both male and female halves must be replaced.

These replacement three-pin terminals are as follows:

Table Outfit No. 196681, replace flat prong grounded three-pin terminal, female half with No. 196763 round-prong grounded three-pin terminal, female half.

BA5 Motor on 66-16 Machine, replace flat-prong grounded three-pin terminal, male half, with No. 197152 round-prong grounded three-pin terminal, male half.

15-91 Machine, replace terminal as outlined above for BA5 Motor.

201-2 Machine, replace flat-prong grounded three-pin terminal (with switch compartment), male half, with No. 197151 round-prong grounded three-pin terminal (with switch compartment), male half.

To replace three-pin terminal, male half, remove from motor or machine by removing fastening screw and disconnect all leads after removing three thumb nuts. Reconnect leads to round-prong grounded three-pin terminal, per wiring diagram on Page 14, and secure with thumb nuts. Attach three-pin terminal to motor or machine with fastening screw.

To replace three-pin terminal, female half, proceed as follows:

1. Disassemble flat-prong three-pin terminal by removing two snap rings and two fastening screws and nuts.
2. Disassemble lead from the two prongs and ground contact by removing lead fastening screws.
3. Cut off eyelets from white and black lead.
4. Restrip lead as shown on Fig. 7a.

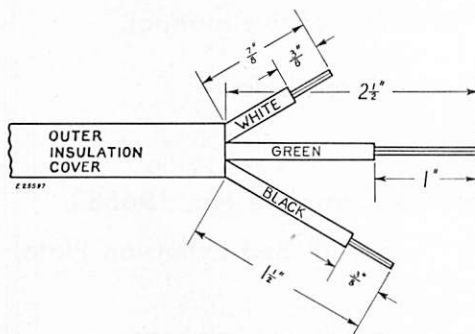


Fig. 7a. Stripping of lead for assembly of round-prong three-pin terminal.



Fig. 7b. Assembly of Lead to Sleeve

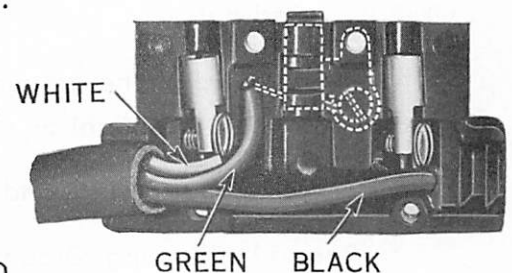


Fig. 7c. Position of Three-Pin Terminal Body Half when assembling lead.

5. Tin all three leads with solder and a hot soldering iron. Use non-corrosive soldering paste to assist tinning or rosin core solder.

**GROUNDING OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE**

6. Disassemble round-prong three-pin terminal, female half, No. 196763, by removing four fastening screws and nuts.
7. Fasten the two outside terminal sleeves to the black and white leads by sliding stripped end of lead between the two sides of sleeve, directly under fastening screw, and tightening screw, see Fig. 7b.
8. Place the body half of the three-pin terminal which has the recess for the ground contact on the bench, inside up, as shown in Fig. 7c.
9. Thread the bare portion of the green (ground) lead through the small hole between the two sleeve cavities.
10. Place the two sleeves in the two outside cavities and the lead (with the outer jacket) in the lead entrance hole at the left. Arrange individual conductors in cavity so that they will not interfere with assembly with other half.
11. Place lead entrance hole plug in lead entrance hole at right.
12. Fasten two halves together with the two screws and nuts at the lead end of terminal and the one screw and nut, which does not secure the ground contact, at terminal sleeve end.
13. Pass ground lead UNDER SPRING TAB of ground contact and secure to ground contact with lead fastening screw.
14. Place ground contact in position and secure with remaining fastening screw and nut.

The effectiveness of the ground connection on this outfit may be easily checked with a two-cell metal case flashlight as shown in Fig. 4, Part 3, Section 1 of this manual.

For parts charts, parts lists and wiring diagrams see pages listed below:

Page 11—Showing Grounded Outfit No. 196681.

Page 12—Parts Chart and Parts List for Junction Box Complete No. 196682.

Page 13—Parts Chart and Parts List for Machine Lead with Bed Extension Plate, No. 196685.

Page 14—Schematic Wiring Diagram for Grounded Outfit No. 196681.

Page 15—Pictorial Wiring Diagram for Grounded Outfit No. 196681.

GROUNDING OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE

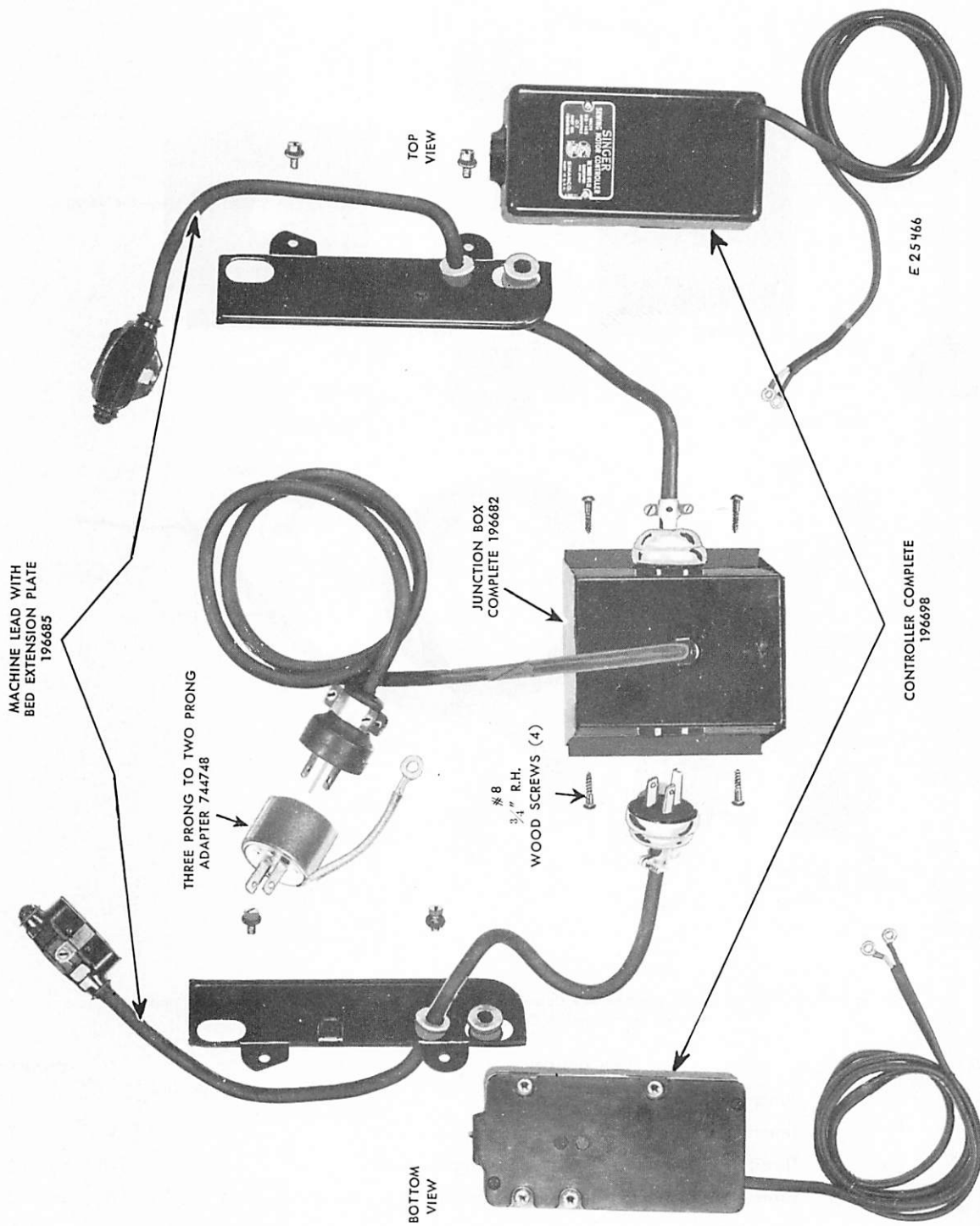


Fig. 8. Grounded Outfit No. 196681  
For 409 School Table

## GROUNDED OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE

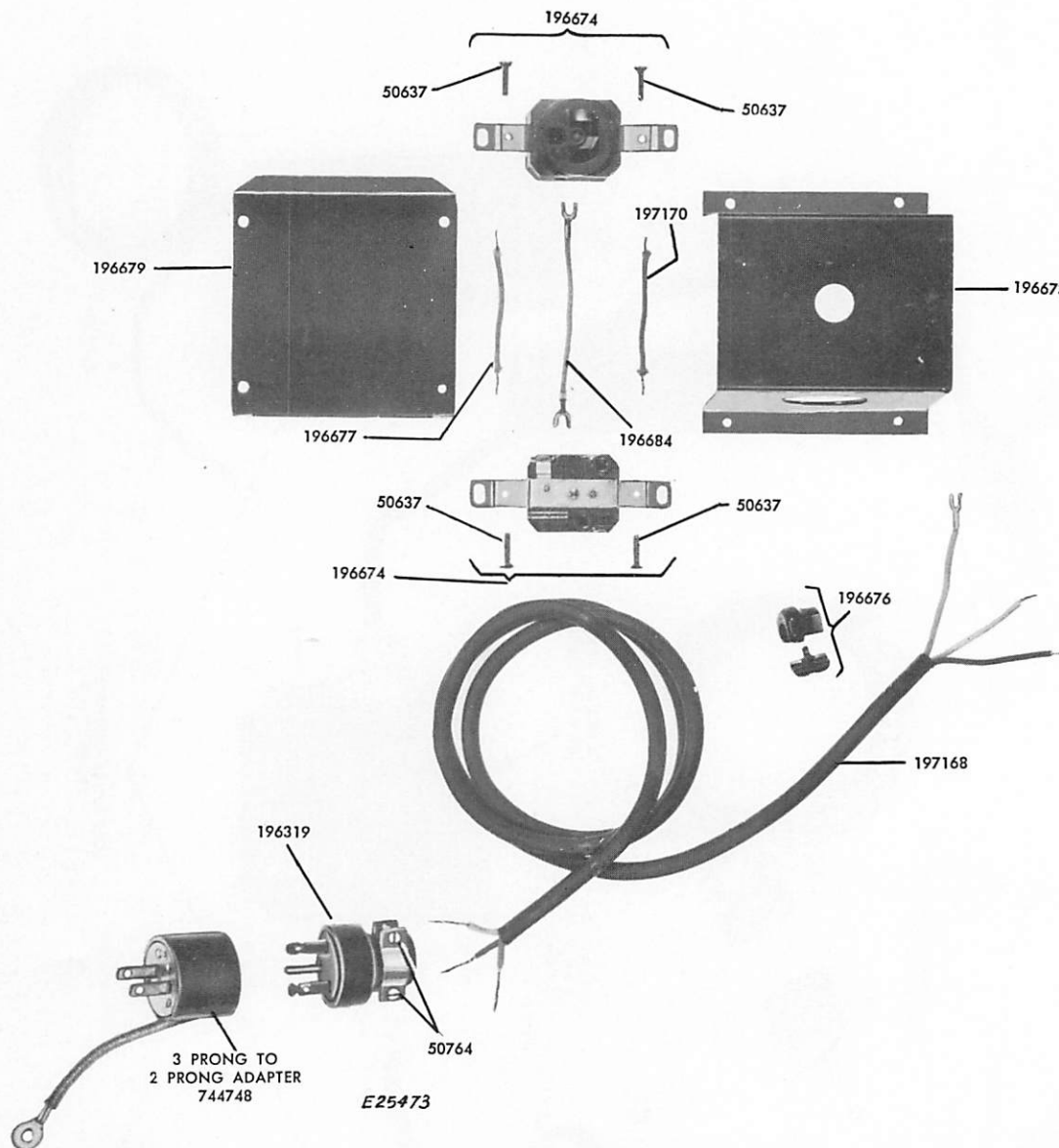


Fig. 9. Parts Chart showing Junction Box Complete 196682 for Grounded Outfit No. 196681, and Grounded Safety Switch Outfits Nos. 196688 and 197175

PART NO.	DESCRIPTION	QUANTITY
196673	Junction Box	1
196679	Junction Box Cover	1
196674	Three-Prong Receptacle with Mounting Screws	2
50637	Three-Prong Receptacle Mounting Screws	4
197168	Line Lead	1
196319	Line Lead Plug	1
50764	Line Lead Plug Strain Relief Screws	2
196676	Line Lead Strain Relief	1
196677	Jumper Lead, Brown	1
196684	Jumper Lead with Terminals, Green	1
197170	Jumper Lead, Black	1
744748	Three-Prong to Two-Prong Adapter	1

## GROUNDED OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE

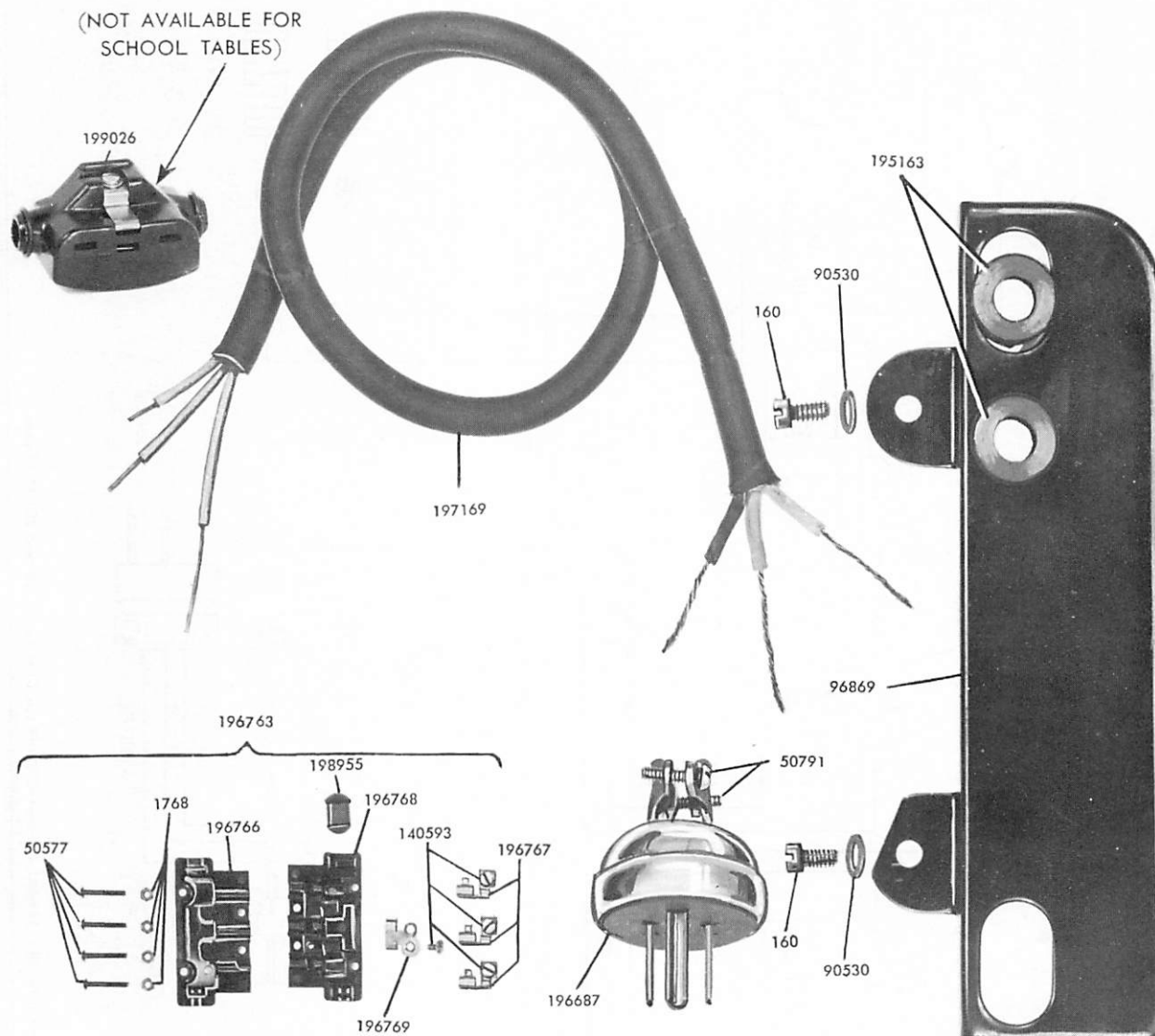


Fig. 10. Parts Chart Showing Machine Lead with Bed Extension Plate Complete No. 196685, for Grounded Outfit No. 196681

E25471

PART NO.	DESCRIPTION	QUAN.
197169	Machine Lead	1
196687	Machine Lead Plug, Three-Prong	1
50791	Machine Lead Plug Strain Relief Screws	2
96869	Bed Extension Plate	1
195163	Bed Extension Plate Grommet	2
160	Bed Extension Plate Fastening Screw	2
90530	Bed Extension Plate Fastening Screw Washer	2
196763	Three-Pin Terminal, Female Half, Complete	1
196768	Three-Pin Terminal Housing, Upper	1
196766	Three-Pin Terminal Housing, Lower	1
196767	Three-Pin Terminal Sleeve	3
196769	Three-Pin Terminal Ground Contact	1
198955	Three-Pin Terminal Cord Hole Plug	1
140593	Three-Pin Terminal Lead Fastening Screw	4
50577	Three-Pin Terminal Clamping Screw	4
1768	Three-Pin Terminal Clamping Screw nut	4

(Insert in Form 20596)



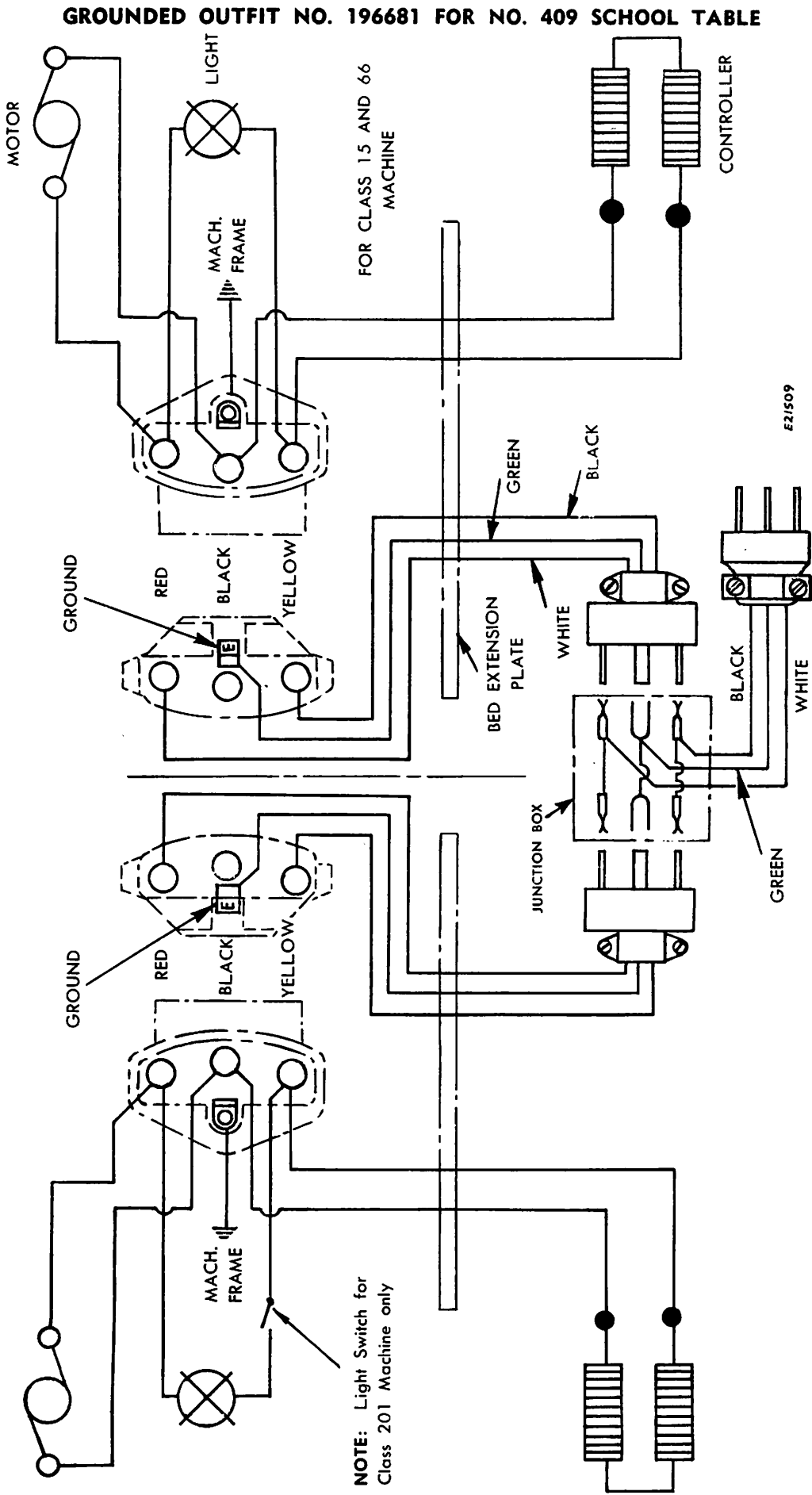


Fig. 11. Wiring Diagram for No. 196681 Grounding Outfit for Classes 15, 66 and 201 Machines on School Table No. 409

GROUNDING OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE

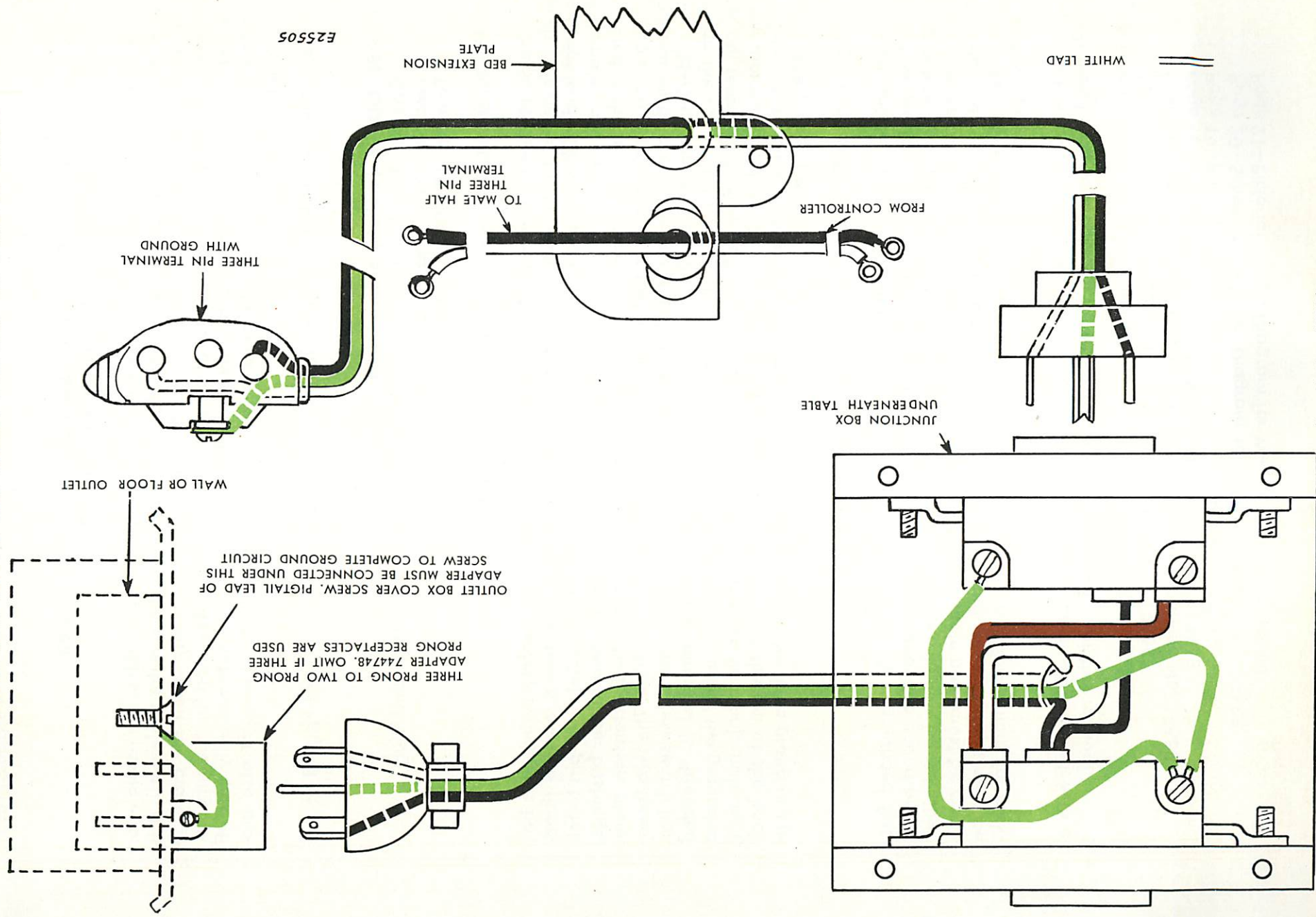


Fig. 12. Pictorial Wiring Diagram for No. 196681 Grounded Outfit for Classes 15, 66 and 201  
Machines on School Table No. 409

**GROUNDING SAFETY SWITCH OUTFIT NO. 196688**

(See illustration on Page 17)

Since the knee control lever is exposed at all times in the School Tables, it is possible for an unauthorized person to run the sewing machine while it is resting in the table well. It is desirable, therefore, to cut off the power to the machine automatically when the machine is lowered into the well. The grounded safety switch outfit has been designed for this purpose. A special safety switch, fitted in a box under the bed extension plate, automatically cuts off the power to the machine when the machine is lowered into the well. This outfit also provides for grounding the machine.

MACHINES should be ordered the same as for the Grounded Outfit, see Page 8 of this section.

TABLE OUTFIT should be ordered as No. 196688 which includes

One No. 196682 Junction Box with Three-Conductor Line Lead and Plug

Two No. 197153 Safety Switch Assembled

Two No. 196698 Controller Complete

The Junction Box is described on Page 8 of this section.

The Safety Switch Assembled includes a bed extension plate, a safety switch in a box (which is fastened to the under side of the bed extension plate with two screws), a three-conductor lead with three-prong plug, a three-conductor lead with grounded three-pin terminal, female half, two strain reliefs for the two three-conductor leads, two rubber bushings, one fitted in the round hole and one fitted in the rear belt slot of the bed extension plate, and two screws and washers to fasten the bed extension plate to the machine. The two three-conductor leads are connected together and to the safety switch inside the safety switch box with solderless connectors. The lead with the grounded three-pin terminal is threaded through the rubber bushing in the round hole of the bed extension plate and the grounded three-pin terminal, female half, is plugged into the grounded three-pin terminal, male half, on the motor or machine. The other lead is threaded through a slot at the top of the back panel of the machine well at the right rear corner and plugged into the three-prong receptacle in the junction box.

The Controller Complete is described on Page 8 of this section.

Grounded Safety Switch Outfit No. 196688 was manufactured with a grounded flat-prong three-pin terminal until early in 1955 and since then with a grounded round-prong three-pin terminal. The grounded flat-prong three-pin terminal will no longer be supplied. All replacement of grounded three-pin terminals, either male or female half, must be made with grounded round-prong three-pin terminals and both male and female halves must be supplied. Refer to Page 9 of this section for replacement terminals and instructions for making replacement.

The effectiveness of the ground connection on this outfit may be easily checked with a two-cell metal case flashlight as shown in Fig. 4, Part 3, Section 1, of this manual.

For parts charts, parts lists and wiring diagrams see pages listed below:

Page 17—Showing Grounded Safety Switch Outfit No. 196688.

Page 12—Parts Chart and Parts List for Junction Box Complete No. 196682.

Page 18—Parts Chart for Safety Switch Assembled No. 197153.

Page 19—Parts List for Safety Switch Assembled No. 197153.

Page 20—Schematic Wiring Diagram for Wiring Outfit No. 196688.

Page 21—Pictorial Wiring Diagram for Wiring Outfit No. 196688.

GROUNDING SAFETY SWITCH OUTFIT NO. 196688 FOR NO. 409 SCHOOL TABLE

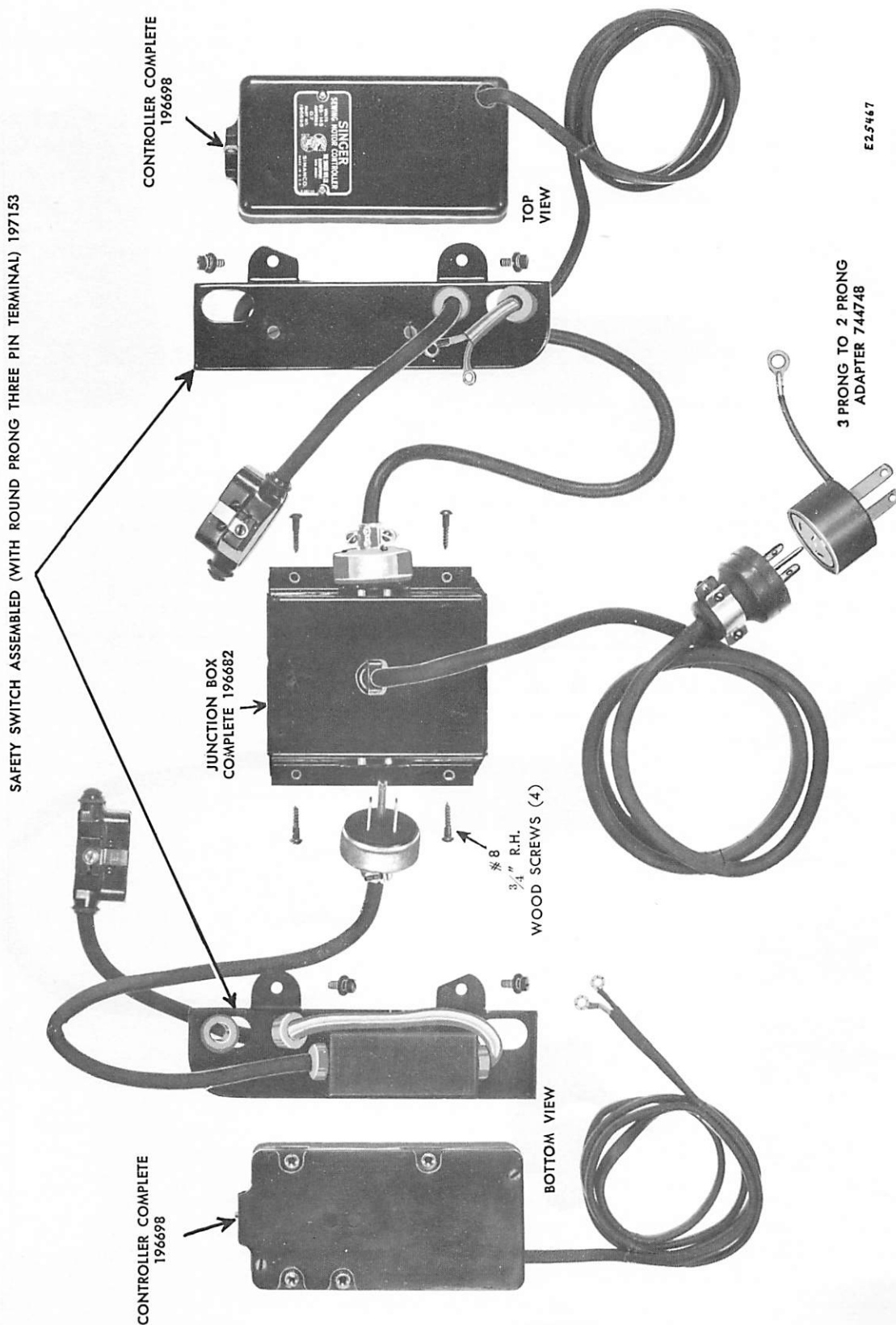


Fig. 13. Grounded Safety Switch Outfit No. 196688  
For 409, 411, 412 and 413 School Tables

GROUNDING SAFETY SWITCH OUTFIT NO. 196688 FOR NO. 409 SCHOOL TABLE

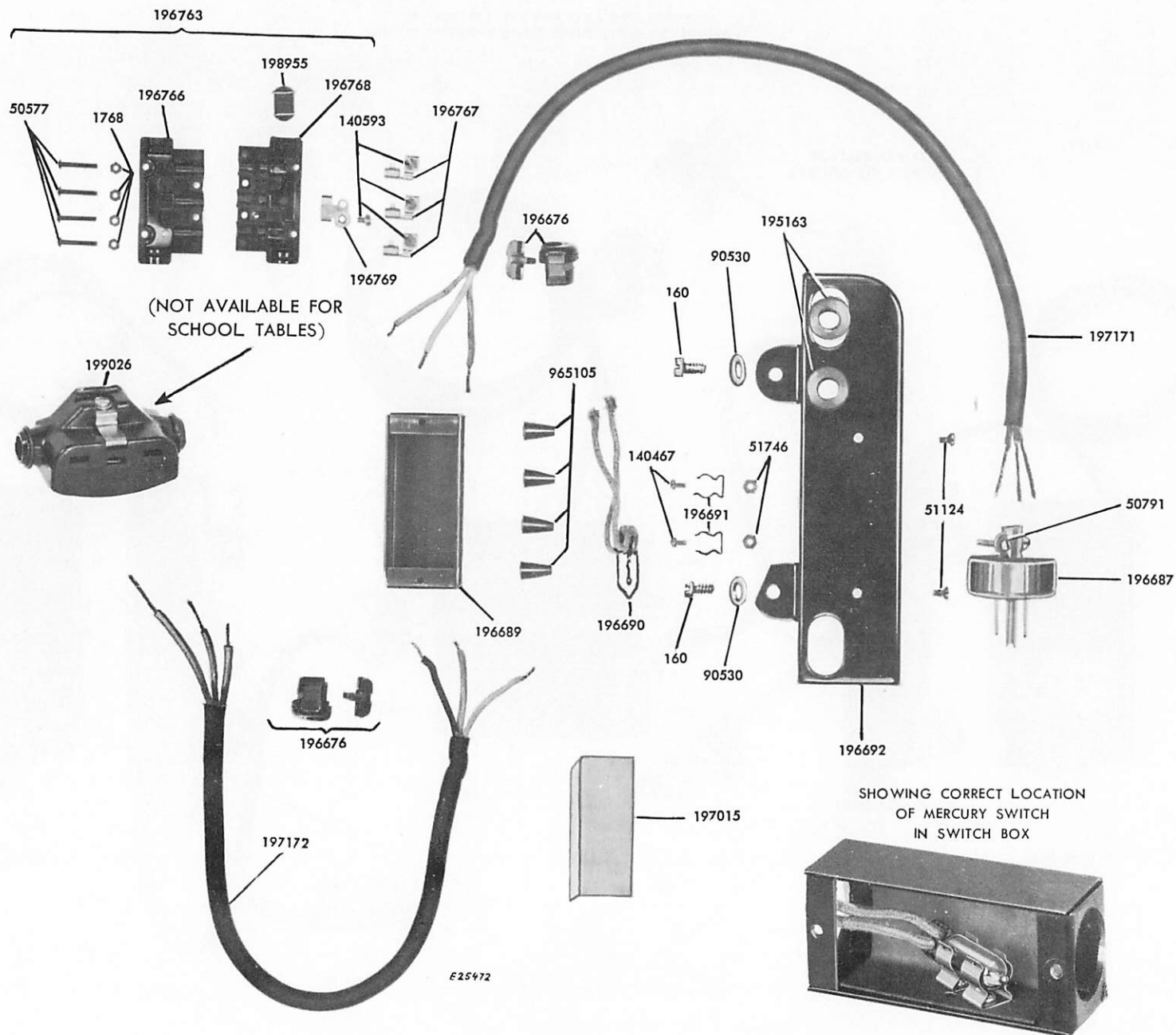


Fig. 14. Parts Chart showing Safety Switch Assembled No. 197153 for Grounded Safety Switch Outfit No. 196688

## PARTS NOT AFFECTED BY COLOR

PART NO.	DESCRIPTION	QUAN.
197172	Machine Lead	1
197171	Lead, to junction box	1
196687	Lead Plug	1
50791	Lead Plug Strain Relief Screws	2
196689	Safety Switch Box	1
196690	Safety Switch	1
197015	Safety Switch Insulation	1
196691	Safety Switch Mounting Bracket	2
140467	Safety Switch Mounting Bracket Fastening Screw	2
51746	Safety Switch Mounting Bracket Fastening Screw Nut	2
965105	Lead Connector	4
196676	Lead Strain Relief	2
196767	Three-Pin Terminal Sleeve	3
140593	Three-Pin Terminal Lead Fastening Screw	4
196769	Three-Pin Terminal Ground Contact	1
195163	Bed Extension Plate Grommet	2
198955	Three-Pin Terminal Cord Hole Plug	1
160	Bed Extension Plate Fastening Screw	2
90530	Bed Extension Plate Fastening Screw Washer	2

## PARTS AFFECTED BY COLOR

Orders for all parts listed below must state color or finish to assure receiving correct part.

PART NO.	DESCRIPTION	QUAN.
196692	Bed Extension Plate	1
51124	Safety Switch Box Fastening Screw	2
196763	Three-Pin Terminal Comp. Female, Round Prongs	1
196768	Three-Pin Terminal Housing, Upper	1
196766	Three-Pin Terminal Housing, Lower	1
50577	Three-Pin Terminal Clamping Screw	4
1768	Three-Pin Terminal Clamping Screw Nut	4

### GROUNDING SAFETY SWITCH OUTFIT NO. 196688 FOR NO. 409 SCHOOL TABLE



# MANUAL OF ELECTRICAL INSTRUCTIONS

## PART 3

Section 2, Page 20  
 GROUNDED SAFETY SWITCH OUTFIT NO. 196688 FOR NO. 409 SCHOOL TABLE

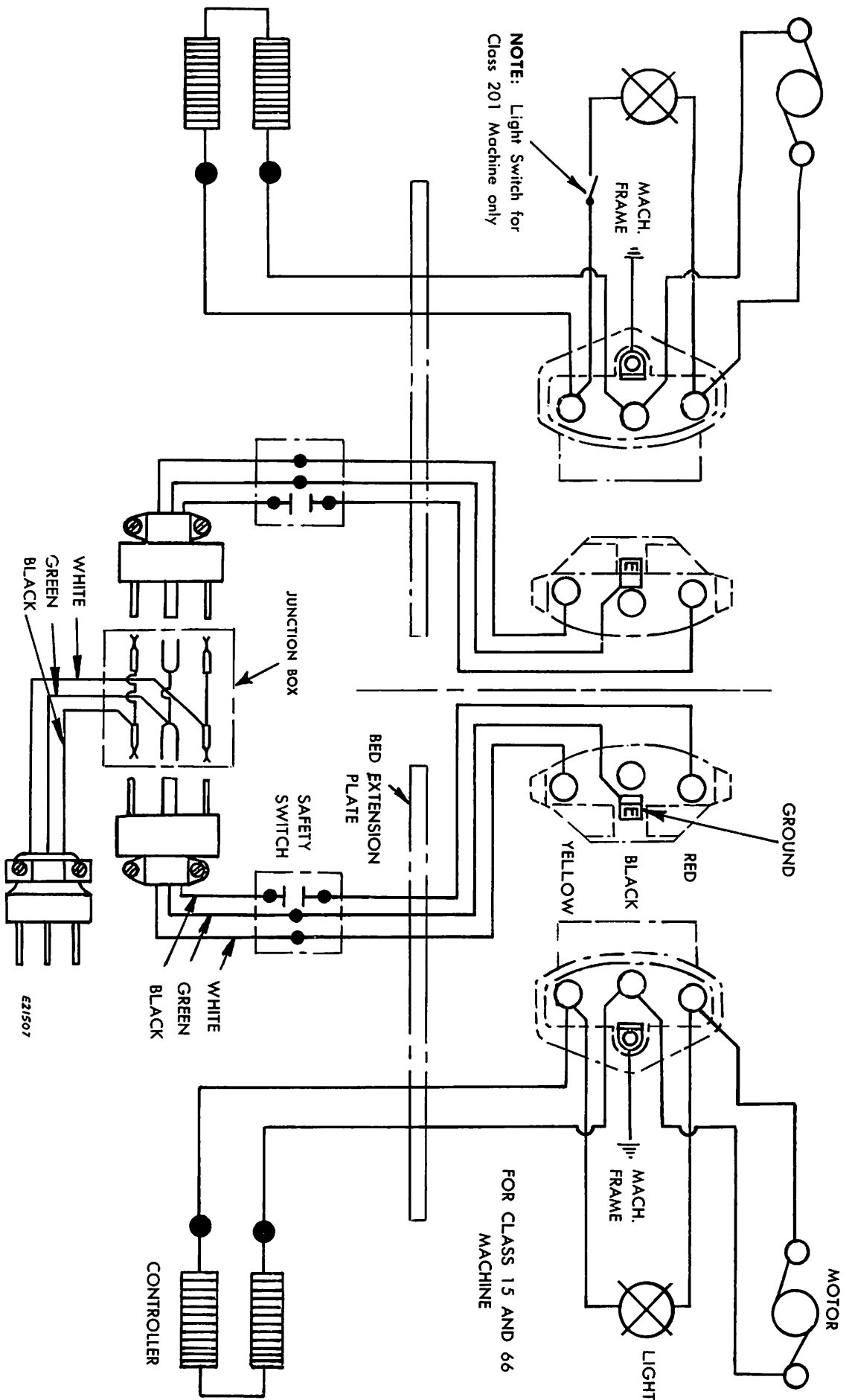
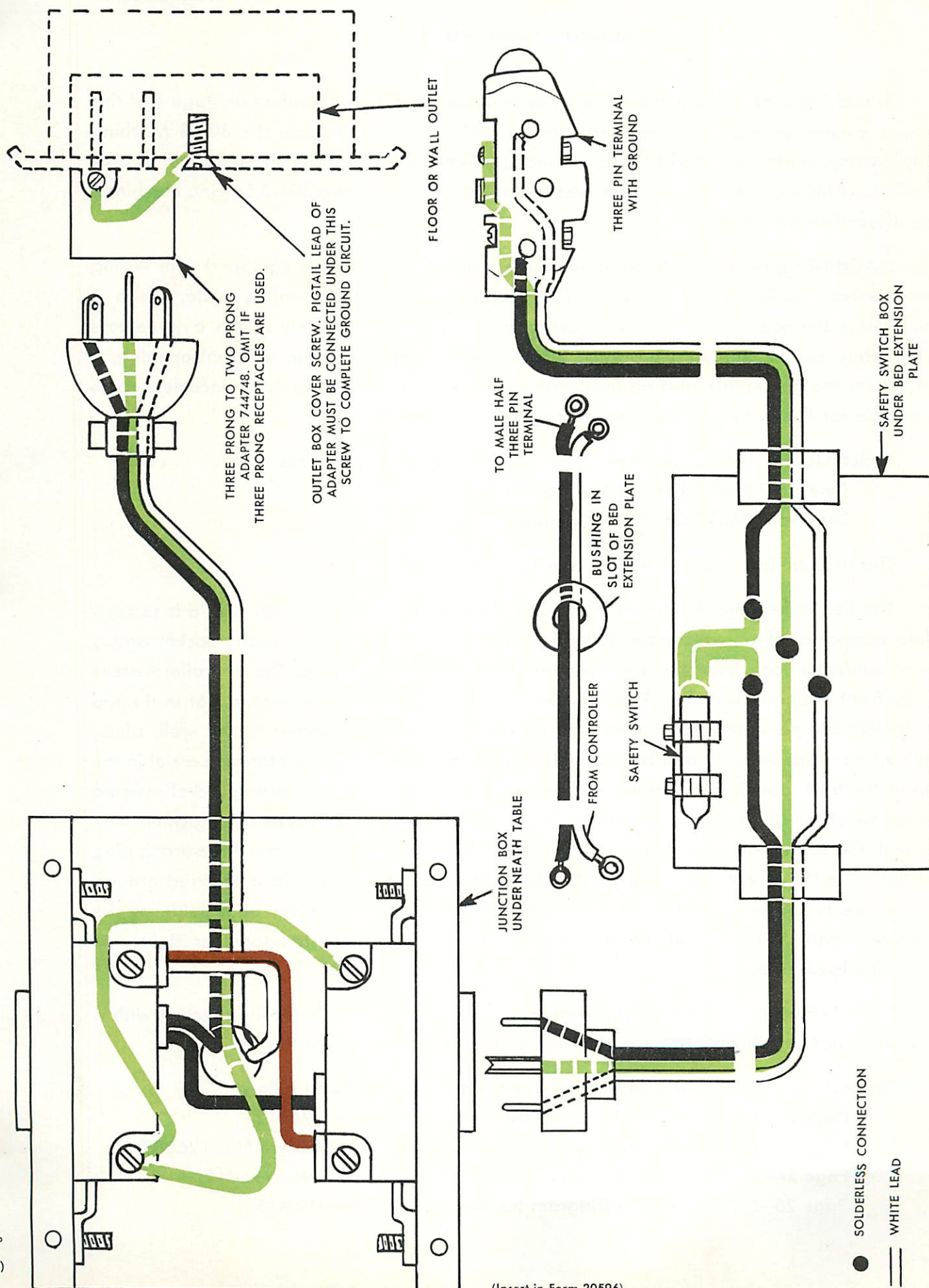


Fig. 15. Wiring Diagram for No. 196688 Grounded Safety Switch Outfit for Classes 15, 66, 206 and 306 on School Tables Nos. 409, 411, 412 and 413

GROUNDING SAFETY SWITCH OUTFIT NO. 196681 FOR NO. 409 SCHOOL TABLE



E25506

Fig. 16. Pictorial Wiring Diagram for No. 196688 Grounded Safety Switch Outfit For Classes 15, 66, 201, 206 and 306 Machines on School Tables Nos. 409, 411, 412 and 413

**SCHOOL TABLE NO. 410**

School Table No. 410 is the same as School Table No. 409, described on Page 1 of this section, except having a Wiring Outfit, No. 196912, to accommodate the 301-3 Machine only. Wiring Outfit No. 196912 is a grounded safety switch outfit composed of one table outfit No. 196928 and two wiring harnesses No. 196929 for the two 301-3 Sewing Machines, see illustration on Page 23.

MACHINES should be ordered as 301-3 Machines. This machine is equipped with Wiring Harness No. 196929 which consists of a six-prong plug with mounting plate, which is mounted in the bed of the machine, leads to the motor, light and safety switch, a nameplate with safety switch mounting brackets, which mounts in the three-pin terminal opening, a gasket for the nameplate and an insulated lead retaining strip. The only replacement parts available for this wiring harness are those shown on Page 23.

TABLE OUTFIT should be ordered as No. 196928 which includes:

One No. 196682 Junction Box Complete

Two No. 196897 Controller Complete

The Junction Box is described on Page 8 of this section.

The Controller Complete consists of a standard treadle type controller with a lead complete composed of a two-conductor lead from the controller to a six-prong socket and a three conductor lead from the six-prong socket to a three-prong plug. The controller fastens to the front panel of the table. The two-conductor lead is threaded through a slot in the top of the left side panel of the machine well shield at the front left corner of the well, along the outside of the left side and back panels, into the machine well again through a slot in the top of the back panel, at the right rear corner of the well, and the six-prong socket inserted in the six-prong plug of the machine. The three-conductor lead leaves the machine well through the same slot in the back panel as the two conductor lead and the three-prong plug is inserted in the receptacle in the junction box. The lead retaining strip is inserted around the two leads and one side inserted in the slot in the projection on the under side of the machine cradle. The two ends of the lead retaining strip are twisted together tightly to retain the leads in position.

The effectiveness of the ground connection on this outfit may be easily checked with a two-cell metal case flashlight as shown in Fig. 4, Part 3, Section 1 of this manual.

For parts lists, parts charts and wiring diagrams see pages listed below:

Page 23—Showing Grounded Safety Switch Outfit No. 196912.

Page 12—Parts Chart and Parts List for Junction Box Complete No. 196682.

Page 24—Schematic Wiring Diagram for Wiring Outfit No. 196912.

Page 25—Pictorial Wiring Diagram for Wiring Outfit No. 196912.

SCHOOL TABLE NO. 410

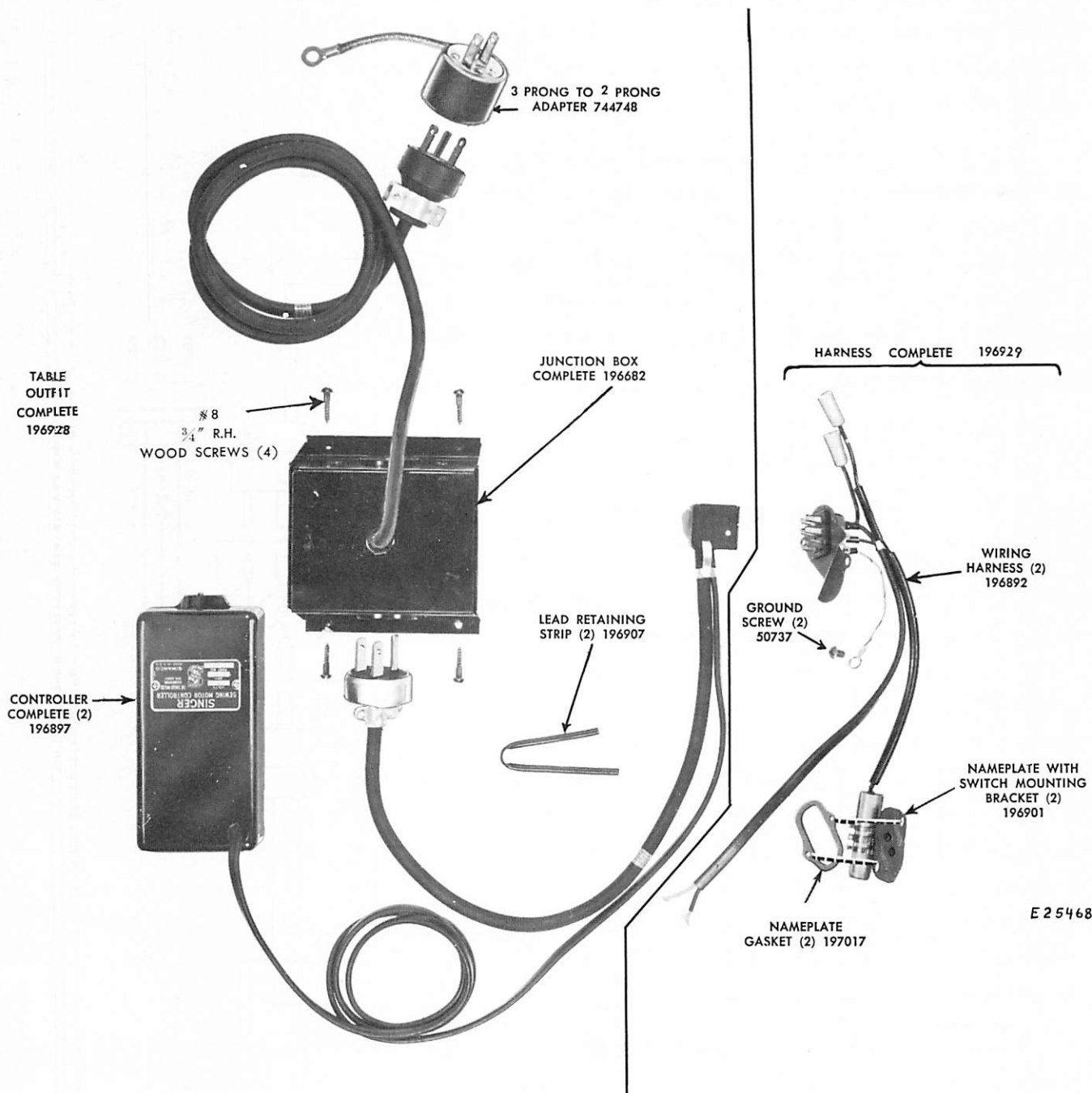


Fig. 17. Grounded Safety Switch Outfit No. 196912 for 301-3 Machine on Nos. 410, 414, 415 and 416 School Tables

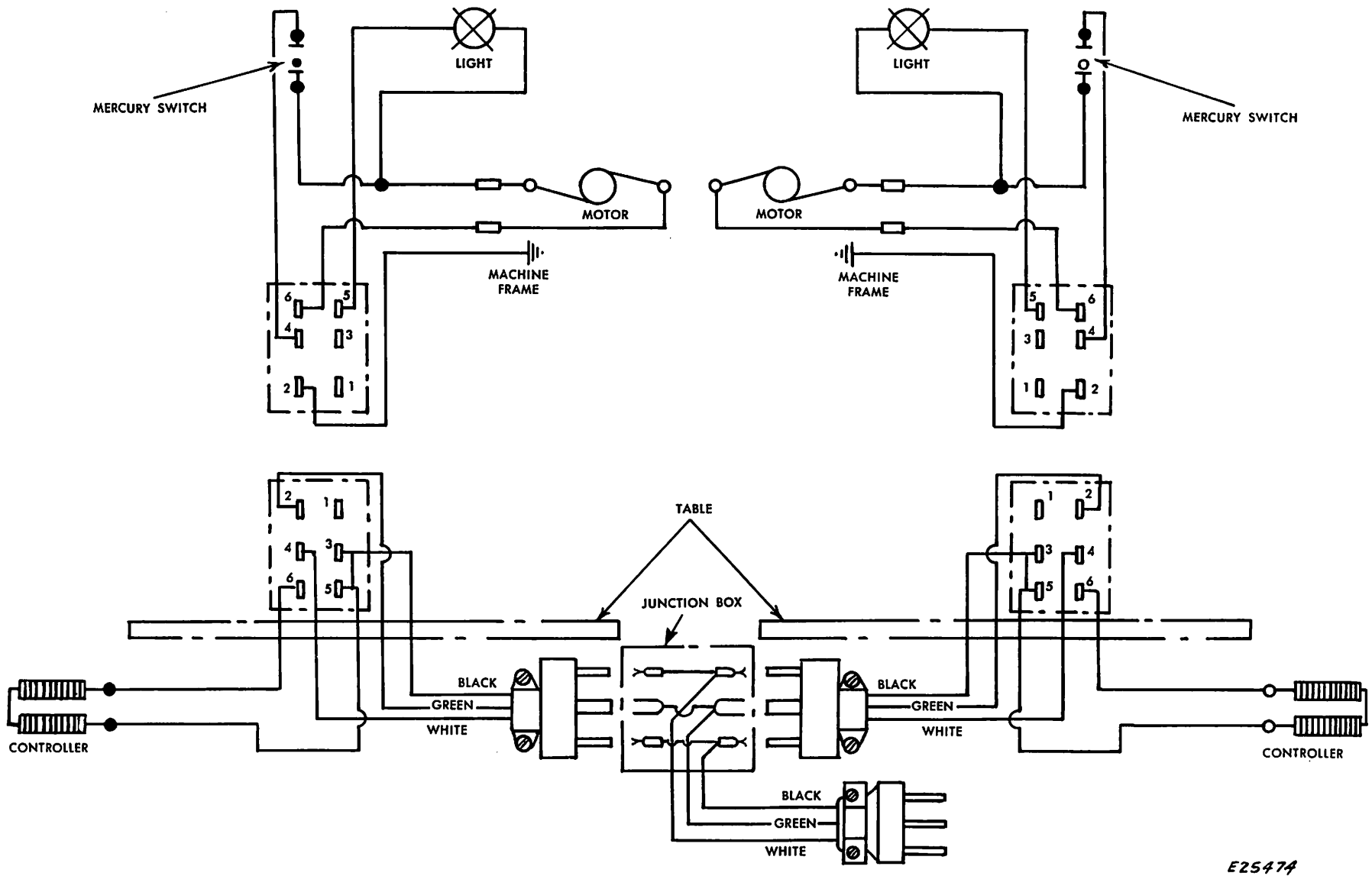


Fig. 18. Wiring Diagram for No. 196912 Grounded Safety Switch Outfit for 301-3 Machine on School Tables Nos. 410, 414, 415 and 416

E25474



SCHOOL TABLE NO. 410

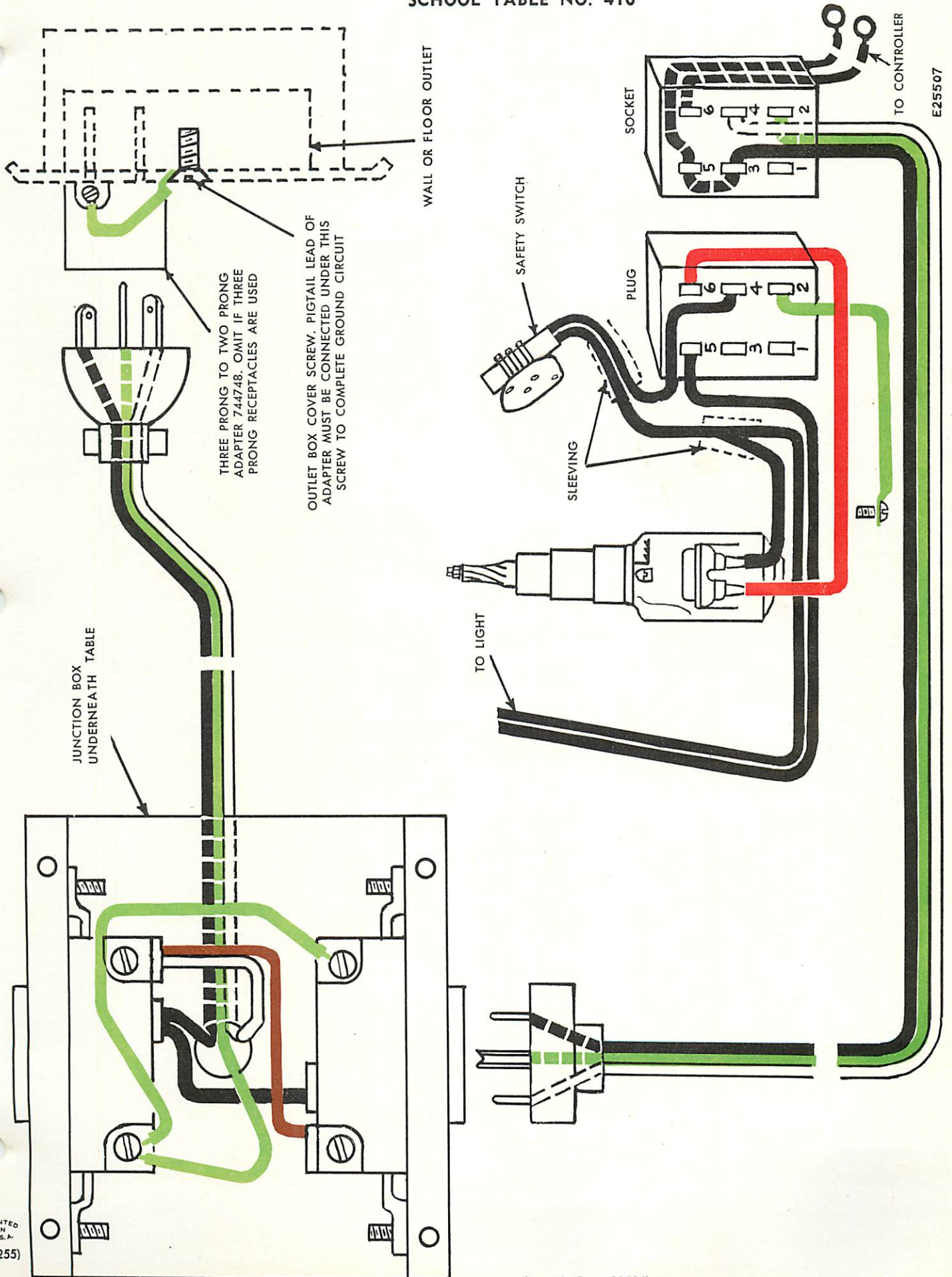


Fig. 19. Pictorial Wiring Diagram for No. 196912 Grounded Safety Switch Outfit for 301-3 Machine on School Tables Nos. 410, 414, 415 and 416



**ELECTRICAL OUTFITS FOR SCHOOL TABLES NOS. 411 TO 416 INCL.**

(School Tables 411 to 416 are obsolete. Tables 411 and 414 are replaced by table 417. Tables 412 and 415 are replaced by table 418 and tables 413 and 416 are replaced by table 419.)

School Tables Nos. 411 to 416 inclusive, shown in Fig. 1, have two wells at opposite corners to take two drop head machines so that a flush work surface is presented when the machines are lowered into the wells. These tables are equipped with knee control using treadle type controllers and knee lever mechanisms. The tables have one small drawer and one tote box space on each side.

School Tables 411 and 414 are the same as School Tables Nos. 409 and 410 respectively except that the tote box space on each side replaced one of the drawers on the original tables.

School Tables Nos. 411, 412 and 413 are used with Machines Classes 15, 66, 201, 206 and 306 and School Tables Nos. 414, 415 and 416 are used with 301-3 Machine.

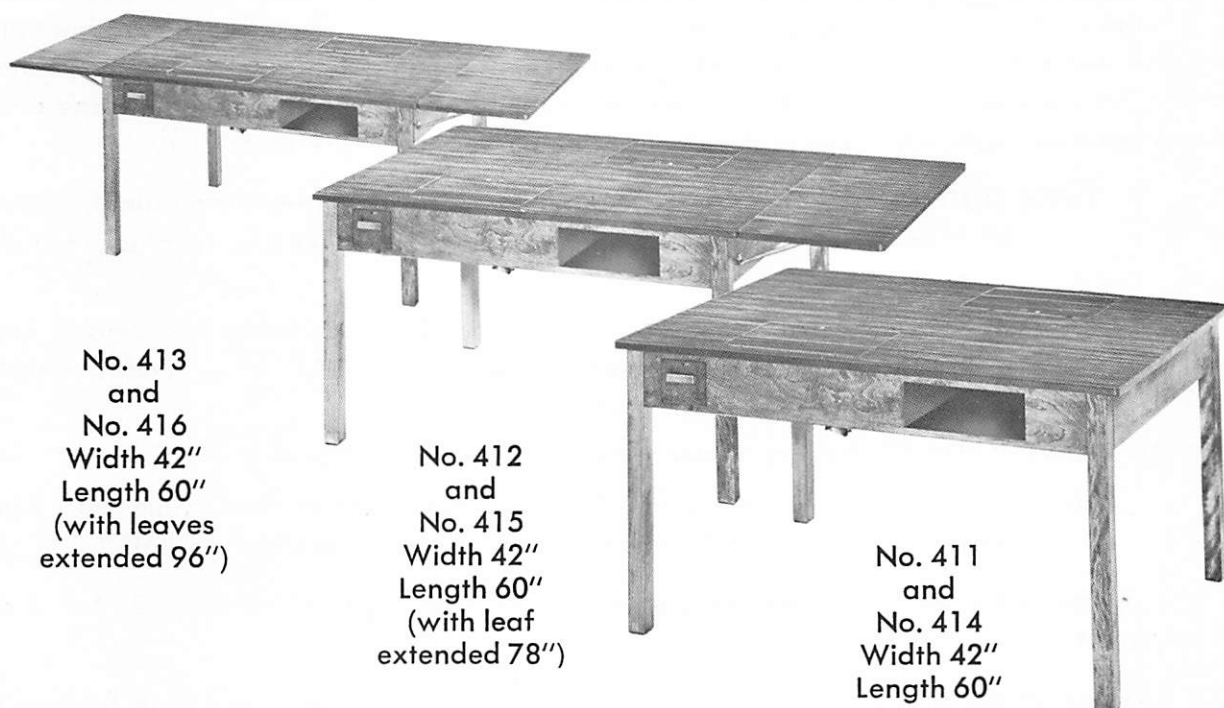


Fig. 1. School Tables Nos. 411 to 416

<p>Above tables Available from: Elizabethport.....</p>	<p>Finishes Blonde Birch with Blonde Formica Top or Dark Birch with Walnut figured Formica Top</p>
--	--

**SCHOOL TABLES NOS. 411, 412 and 413**

School Tables Nos. 411, 412 and 413 are equipped with Grounded Safety Switch Outfit No. 196688 only. Machines used in these tables are Classes 15, 66, 201, 206 and 306 and are special machines and orders must state special features to insure receiving proper machines which will be grounded.

MACHINES must be ordered as follows:

66-16 Machine with BA5 Motor and machine bed drilled and tapped for bed extension plate No. 96869.

## SCHOOL TABLES NOS. 411, 412 AND 413 (Continued)

15-91 Machine with GROUNDED THREE-PIN TERMINAL (Male Half) No. 197152 and machine bed drilled and tapped for bed extension plate No. 96869.

201-2 Machine with GROUNDED THREE-PIN TERMINAL (Male Half) No. 197151 and machine bed drilled and tapped for bed extension plate No. 96869.

206 Class Machine with BA5 Motor

306W25 Machine with BA5 Motor

TABLE OUTFIT should be ordered as No. 196688, see Page 16 of Part 3, Section 2 of this manual.

From its adoption until early in 1955 this Wiring Outfit No. 196688, was manufactured with a grounded flat-prong three-pin terminal and since early in 1955 it has been manufactured with a grounded round-prong three-pin terminal. The grounded flat-prong three-pin terminal will no longer be supplied. All replacement of grounded three-pin terminals, either male or female half, must be made with grounded round-prong three-pin terminals and both halves must be replaced. These replacement three-pin terminals are as follows:

TABLE OUTFIT NO. 196688, replace grounded flat-prong three-pin terminal, female half, with No. 196763 grounded round-prong three-pin terminal, female half.

BA5 MOTOR on 66-16, Class 206 or 306W25 MACHINE, replace grounded flat-prong three-pin terminal, male half, with No. 197152 grounded round-prong three-pin terminal, male half.

15-91 MACHINE, replace terminal as outlined for BA5 Motor.

201-2 MACHINE, replace grounded flat-prong three-pin terminal, male half, with No. 197151 grounded round-prong three-pin terminal, male half.

Instructions for making these replacements appear on Page 9 of Section 2, Part 3 of this manual.

Because of the change from flat-prong to round-prong grounded three-pin terminals, machines and tables occasionally come together in the field with a flat-prong terminal on one unit and a round-prong terminal on the other unit. In all such cases always replace the flat-prong terminal, either male or female half, with the correct round-prong terminal, as outlined above.

## BEIGE CONVERSION KIT

The 306W25 Machine is manufactured in black and beige. Wiring Outfit No. 196688 was manufactured in black only. A conversion kit, No. 197244, is available for converting Wiring Outfit No. 196688 from black to beige and all outfits intended for use on beige 306W25 Machines should be converted with this kit. Conversion Kit No. 197244 consists of the following parts:

One No. 196692 Bed Extension Plate, Beige

One No. 196763 Grounded Three-Pin Terminal, Female Half, Beige

Two No. 51124J Safety Switch Box Fastening Screws

**SCHOOL TABLES NOS. 411, 412 AND 413**

To make this conversion proceed as follows:

1. Disconnect ground lead from ground contact by loosening lead fastening screw. Remove grounded three-pin terminal from lead by removing four fastening screws and nuts and separating the two halves, leaving the terminal sleeves on the lead, if terminal being replaced is the round-prong type. If terminal being replaced is the old flat-prong type, follow instructions on Page 9, Section 2, Part 3, Items 1 to 7.
2. Remove the two screws, No. 51124X, securing the safety switch box to the bed extension plate and pull lead from safety switch box through rubber bushing in bed extension plate. Discard screws No. 51124X.
3. Remove bushing from bed extension plate and discard black bed extension plate.
4. Insert rubber bushing in beige bed extension plate.
5. Thread lead from safety switch box through rubber bushing in bed extension plate.
6. Assemble safety switch box to beige bed extension plate with the two No. 51124J safety switch box fastening screws.
7. Disassemble beige grounded three-pin terminal by removing four fastening screws and nuts and discard the two outer terminal sleeves, if terminal being replaced is the round-prong type. If terminal being replaced is the old flat-prong type, the beige terminal has already been disassembled and the outer sleeves assembled to the lead.
8. Assemble beige grounded three-pin terminal to lead according to instructions on Page 9, Part 3, Section 2, items 8 to 14.

For parts charts, parts lists and wiring diagrams of Grounded Safety Switch Outfit No. 196688 refer to Part 3, Section 2, pages listed below:

- Page 17—Showing Grounded Safety Switch Outfit No. 196688
- Page 12—Parts Chart and Parts List for Junction Box Complete No. 196682
- Page 18—Parts Chart for Safety Switch Assembled No. 197153
- Page 19—Parts List for Safety Switch Assembled No. 197153
- Page 20—Schematic Wiring Diagram for Wiring Outfit No. 196688
- Page 21—Pictorial Wiring Diagram for Wiring Outfit No. 196688

**SCHOOL TABLES NOS. 414, 415 and 416**

School Tables Nos. 414, 415 and 416 are equipped with Grounded Safety Switch Outfit No. 196912 which is composed of Wiring Outfit No. 196928 for the table and two Wiring Harnesses No. 196929 for the two machines. This outfit is the same as that supplied with the 410 School Table.

Machines should be ordered as 301-3, see Part 3, Section 2, Page 22 for description.

TABLE OUTFIT should be ordered as No. 196928, see Part 3, Section 2, Page 22 for description.

For parts charts, parts lists and wiring diagrams of Grounded Safety Switch Outfit No. 196912 refer to Part 3, Section 2, Pages listed below:

- Page 23—Showing Grounded Safety Switch Outfit No. 196912
- Page 12—Parts Chart and Parts List for Junction Box Complete No. 196682
- Page 24—Schematic Wiring Diagram for Wiring Outfit No. 196912
- Page 25—Pictorial Wiring Diagram for Wiring Outfit 196912

The effectiveness of the ground connection on Grounded Safety Switch Outfits Nos. 196688 and 196912 may be easily checked with a two-cell metal case flashlight as shown in Fig. 4, Part 3, Section 1 of this manual.



**ELECTRICAL OUTFITS FOR SCHOOL TABLES NOS. 417, 418 AND 419**

School Tables Nos. 417, 418 and 419, illustrated in Fig. 1, have two wells at opposite corners to take two drop head machines so that a flush work surface is presented when the machines are lowered into the wells. These tables are equipped with knee control using treadle type controllers and knee lever mechanisms. The tables have one small drawer and one tote box space on each side. School Tables 417, 418 and 419 are the same as School Tables Nos. 411 to 416 except having a Wiring Outfit which permits the use of any machine normally used in School Tables. These are the first School Tables in which Classes 301 and 401 Machines can be used interchangeably with other machines. The machines adopted for use in these School Tables are 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 301-4, 306-26, 319-3 and 401-4.

These School Tables are equipped with a Grounded Safety Switch Outfit which consists of a Wiring Outfit, No. 197175, for the table, and two Wiring Harnesses for the two Machines. There are three different Wiring Harnesses for the machines, shipped with the machines; one No. 197176 for the 301-4 machine only; one No. 197708 for the 401-4 machine only; and one No. 197177, for 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 306-26 and 319-3 Machines.

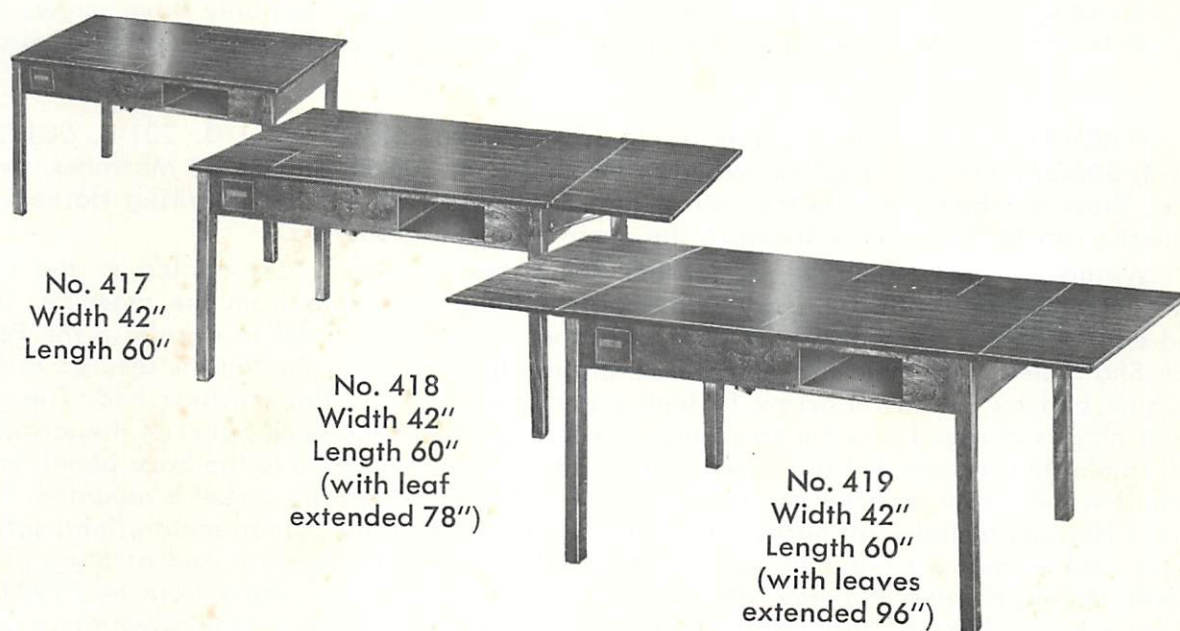


Fig. 1. School Tables Nos. 417, 418 and 419

Above tables

Available from: Elizabethport .....

Finishes

Blonde Birch with Blonde Formica Top or

Dark Birch with Walnut figured Formica Top

TABLE OUTFIT should be ordered as 197175 which includes:

One No. 196682 Junction Box Complete

Two No. 197179 Controller Complete

The Junction Box mounts on the underside of the table at the center. This includes a box, cover, three conductor line lead with three-prong plug, three-prong to two-prong adapter, two electric outlet receptacles, three jumper leads to connect the two receptacles in parallel and four wood screws to fasten the junction box to the table. In schools having three-wire systems with three-prong grounded outlets the three-prong plug on the end of the line lead is plugged into the wall or floor electrical outlet, and the three-prong to two-prong adapter is

**SCHOOL TABLES 417, 418 AND 419**

not used. In schools having two-wire systems with two-prong electrical outlets the adapter is plugged into the wall or floor electrical outlet and the pigtail lead emerging from the adapter is fastened under the screw securing the outlet box cover to the outlet. **IT IS IMPORTANT THAT THE PIGTAIL LEAD WIRE BE CONNECTED UNDER THE OUTLET BOX COVER SCREW TO COMPLETE THE GROUND WIRE CIRCUIT.** The three-prong plug on the end of the line lead is then plugged into the adapter.

The Controller Complete consists of a treadle type controller with lead complete. The Controller Lead Complete consists of a two conductor lead from the controller to a six-prong socket on a mounting plate and a three-conductor lead from the six-prong socket to a three-prong plug. The controller is mounted on the front panel of the table. The controller lead is threaded through a slot in the top of the left side panel of the machine well shield at the front left corner of the well, thence along the outside of the left side and back panels. The six-prong socket with mounting plate is fastened to the outside of back panel with the six-prong socket vertically centered in the lower half of the 2-1/2" diameter hole in the back panel. The mounting plate of the six-prong socket has four screw holes but only three screws are used to fasten it to the back panel, the screw being omitted from the upper left hand corner.

MACHINES should be ordered as 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 301-4, 306-26, 319-3 and 401-4. When ordering 301-4, 306-26 and 319-3 Machines, state color. These machines include the correct motor, three-pin terminal and Wiring Harness to connect them to the table and insure the machine being grounded.

Wiring Harness No. 197176, for the 301-4 Machine only, is mounted in the machine with a four conductor lead with six-prong plug extending from the machine. This lead emerges from the machine through a rubber grommet inserted in a hole in the Feed Rock Shaft Clearance Hole Cover Plate. A strain relief clamp on the lead is secured to the machine bed by the lower screw fastening the cover plate to the machine bed. The six-prong plug is plugged into the six-prong socket mounted on the back panel of the machine well shield and a second strain relief clamp on the lead is fastened to the back panel, with a small wood screw, directly above the hole in which the six-prong socket is mounted. This Wiring Harness includes all necessary wiring from the six-prong plug to motor, light, safety switch and frame, a combined rating plate and safety switch bracket and a rating plate gasket. Wiring Harness No. 197708 for the 401-4 Machine only, differs from No. 197176 in that it has a different Shaft Hole Clearance Cover Plate, and a longer cord with terminal.

Wiring Harness No. 197177, for 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 306-26 and 319-3 Machines, consists of a bed extension plate, a safety switch box, a safety switch, two safety switch brackets, a safety switch box insulation piece, two screws to mount the safety switch box to the bed extension plate, two screws and nuts to mount the brackets to the safety switch box, a four conductor lead with six-prong plug, a four conductor lead with grounded three-pin terminal, two split strain reliefs for the two four conductor leads, a strain relief clamp for the four conductor lead with six-prong plug, five solderless connectors, a rubber grommet and two screws and washers (to fasten the bed extension plate to the machine bed). The two four conductor leads enter the safety switch box through holes in the ends of the box and are secured by the two split strain reliefs. These leads are connected together and to the safety switch (in the safety switch box) by means of the five solderless connectors. The lead with the grounded three-pin terminal is threaded through the rubber grommet inserted in the round hole in the bed extension plate and the grounded three-pin terminal, female half, connected to the grounded three-pin terminal, male half, on the sewing machine or motor. The six-pin plug is connected to the six-prong socket mounted on the back panel of the machine well shield and the strain relief clamp on the lead fastened to the back panel with a small wood screw directly above the hole in which the six-prong socket is mounted.

**SCHOOL TABLES 417, 418 AND 419**

When installing machines in School Tables Nos. 417, 418 and 419 it is important to fasten the strain relief clamp to the back panel of the machine well, as directed on the preceding page, to prevent movement of the plug when the machine is raised or lowered.

Black 306 - 26 and 319 - 3 Machines are provided with a Wiring Harness, No. 197177 Black, having black bed extension plate, safety switch box fastening screws and grounded three-pin terminal, female half. Beige 306 - 26 Machine is provided with a Wiring Harness, No. 197177 Beige, having beige bed extension plate and grounded three-pin terminal, female half, and nickel plated safety switch box fastening screws. Green 319 - 3 Machine is equipped with a Wiring Harness No. 197177 Green, having green bed extension plate and grounded three-pin terminal, female half, and nickel plated Safety switch box fastening screws. When ordering replacement Wiring Harness No. 197177, or replacement parts for this harness, be sure to state color required. See replacement parts list on Page 7.

The effectiveness of the ground connection on these outfits may be easily checked with a two-cell metal case flashlight as shown in Fig. 4, Part 3, Section 1.

For parts charts, parts lists and wiring diagrams see following pages:

Page 4—Showing Wiring Outfit No. 197175

Page 5—Showing Wiring Harnesses Nos. 197176, 197177 and 197708

Page 6—Parts Chart for Wiring Harness No. 197177

Page 7—Parts List for Wiring Harness No. 197177

Page 8—Schematic Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197177.

Page 9—Pictorial Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197177

Page 10—Schematic Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197176 and 197708

Page 11—Pictorial Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197176 and 197708

Refer to Part 3, Section 2, Page 12 for replacement parts chart and parts list for Junction Box Complete No. 196682.

The only replacement parts available for Wiring Harness Nos. 197176 and 197708 are those shown on Page 5.



SCHOOL TABLES 417, 418 AND 419

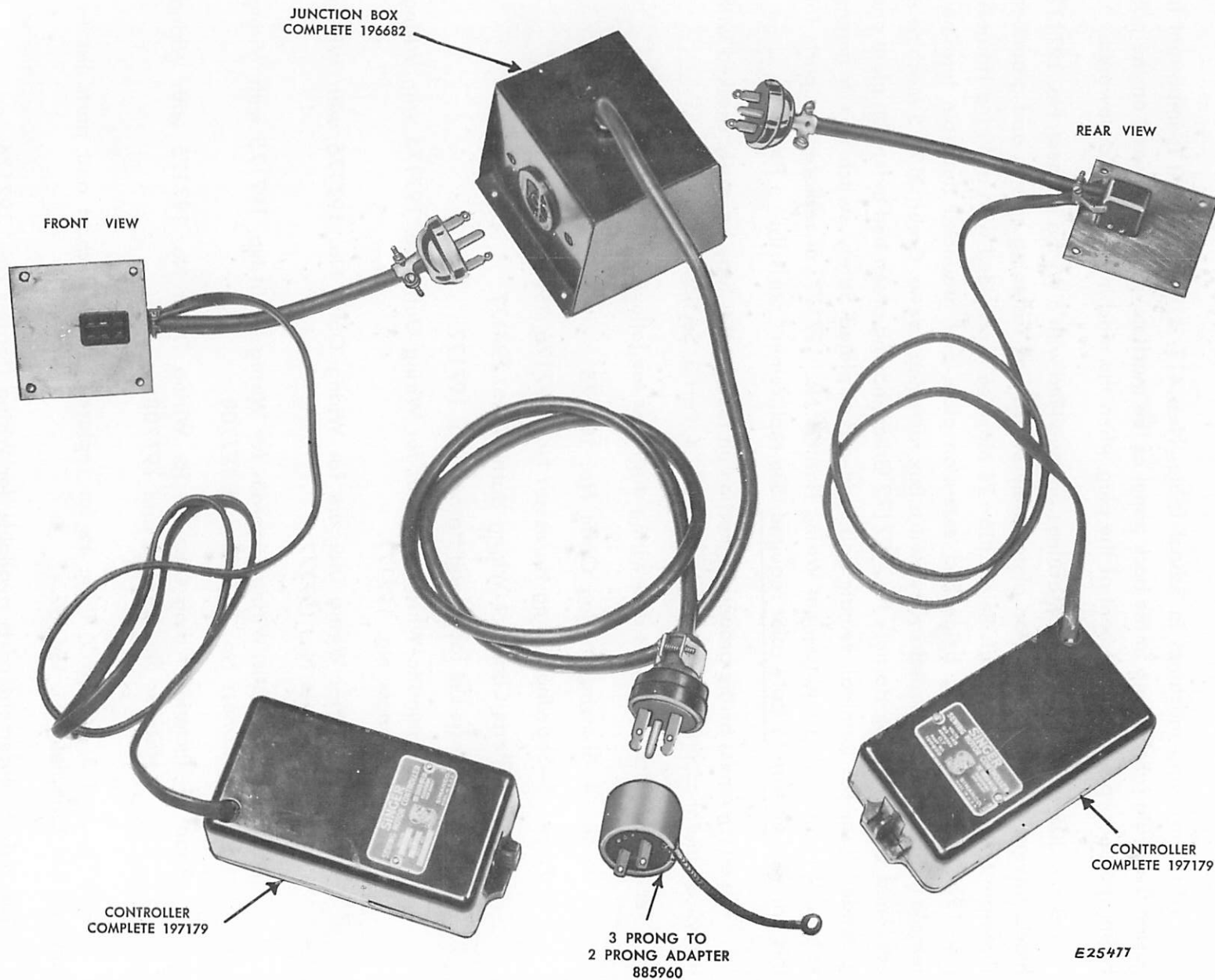


Fig. 2. Wiring Outfit No. 197175 for  
School Tables Nos. 417, 418 and 419

SCHOOL TABLES 417, 418 AND 419

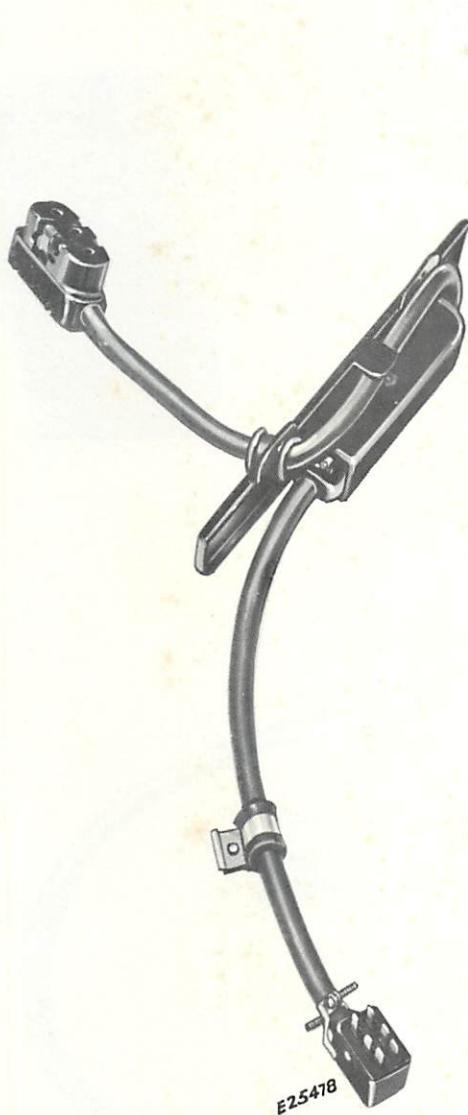


Fig. 3  
Wiring Harness No. 197177  
for 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 306-26  
and 319-3 Machines

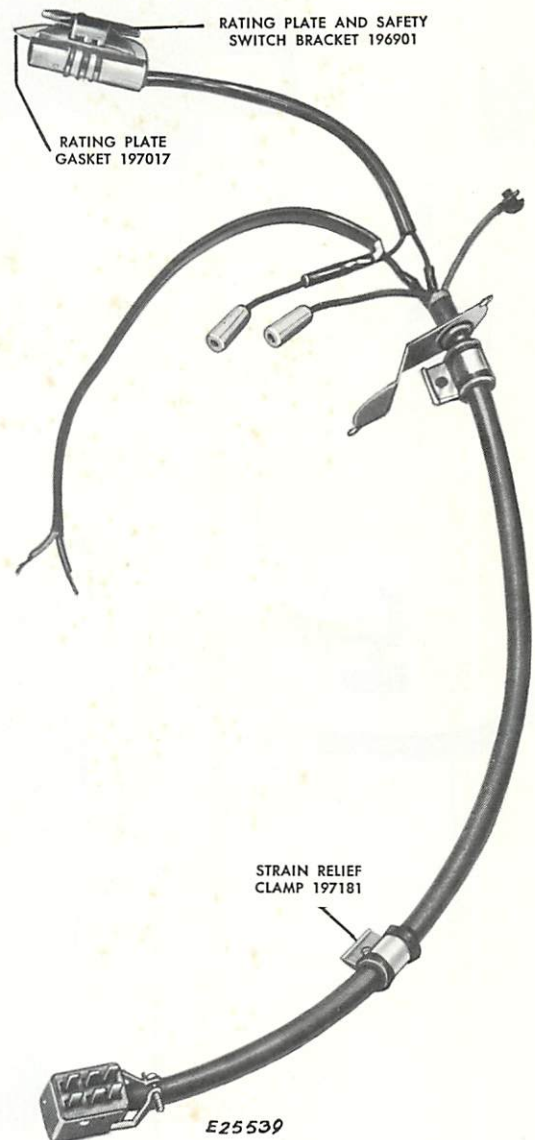


Fig. 4  
Wiring Harness No. 197176 for 301-4 Machine (Not Illustrated)  
Wiring Harness No. 197708 for 401-4 Machine

### SCHOOL TABLES 417, 418 AND 419

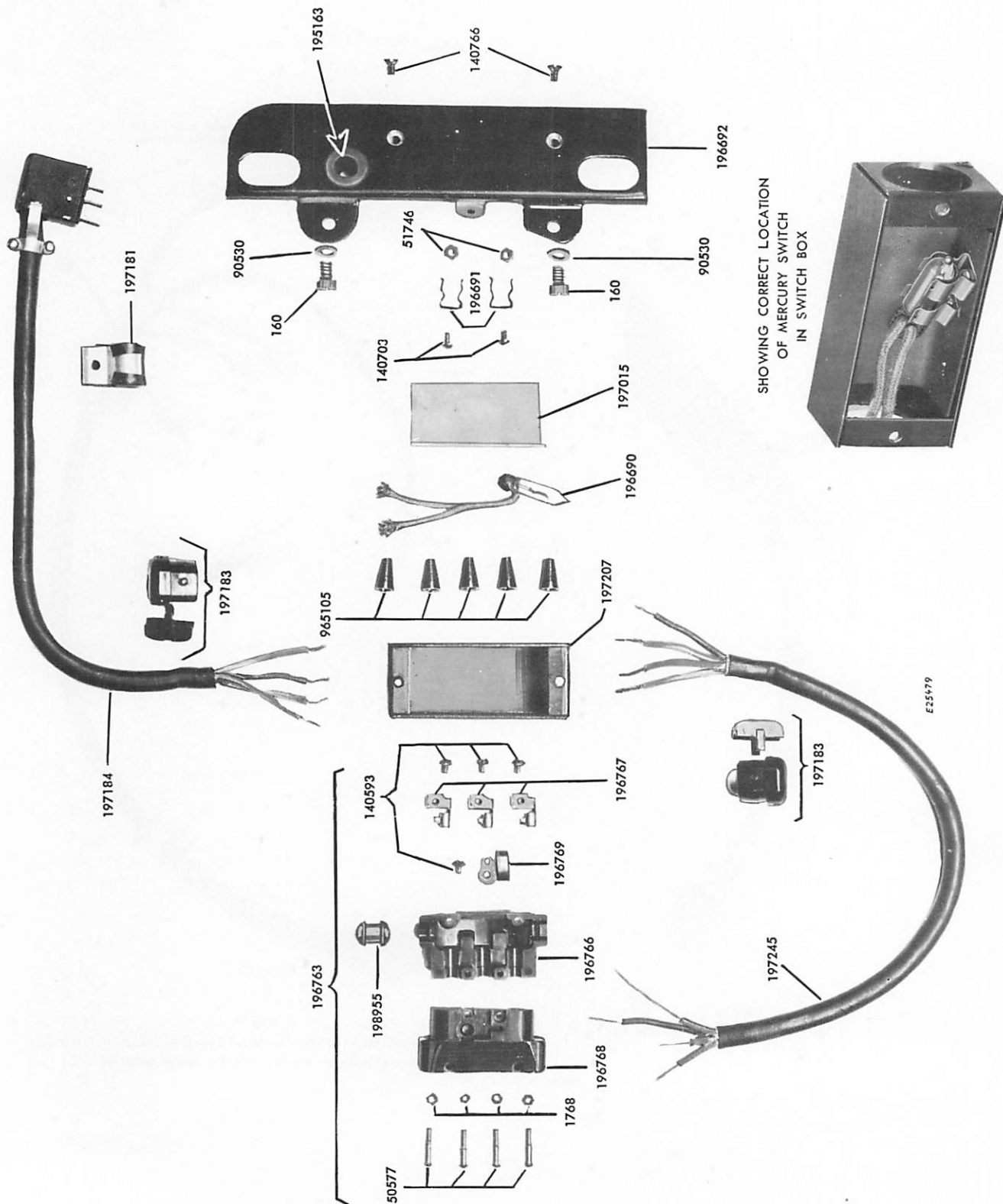


Fig. 5. Parts Chart showing Wiring Harness Complete, No. 197177 for 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 306-26 and 319-3 Machines in School Tables Nos. 417, 418 and 419

**SCHOOL TABLES 417, 418 AND 419**

**PARTS AFFECTED BY COLOR**

Orders for all parts listed below must state color or finish to assure receiving correct part.

PART NO.	DESCRIPTION	QUANTITY
196692	Bed Extension Plate	1
140766	Safety Switch Box Fastening Screw	2
196763	Three-Pin Terminal Complete, Female	1
196766	Three-Pin Terminal Housing, Lower	1
196768	Three-Pin Terminal Housing, Upper	1
50577	Three-Pin Terminal Clamping Screw	4
1768	Three-Pin Terminal Clamping Screw Nut	4

**PARTS NOT AFFECTED BY COLOR**

PART NO.	DESCRIPTION	QUANTITY
197245	Machine Lead	1
197184	Lead with Six-Prong Plug	1
197207	Safety Switch Box	1
196690	Safety Switch	1
197015	Safety Switch Insulation	1
196691	Safety Switch Mounting Bracket	2
140703	Safety Switch Mounting Bracket Fastening Screw	2
51746	Safety Switch Mounting Bracket Fastening Screw Nut	2
965105	Lead Connector	5
197183	Lead Strain Relief	2
197181	Lead Clamp	1
196767	Three-Pin Terminal Sleeve	3
196769	Three-Pin Terminal Ground Contact	1
140593	Three-Pin Terminal Lead Fastening Screw	4
195163	Bed Extension Plate Grommet	1
160	Bed Extension Plate Fastening Screw	2
90530	Bed Extension Plate Fastening Washer	2
198955	Three-Pin Terminal Cord Hole Plug	1

SCHOOL TABLES 417, 418 AND 419

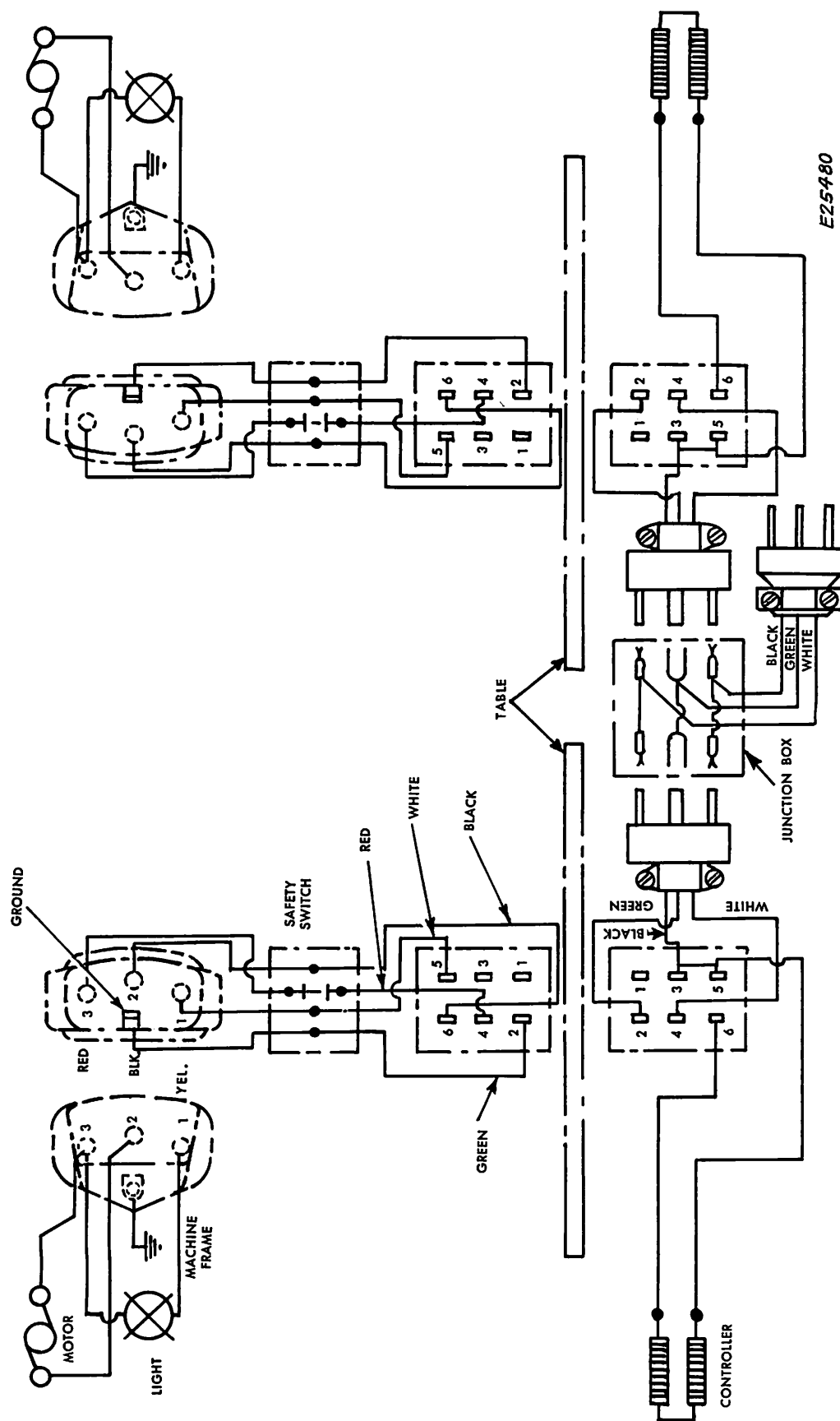


Fig. 6. Wiring Diagram for Grounded Safety Switch Outfit No. 197175 with Harness No. 197177 for 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 306-26 and 319-3 Machines on School Tables Nos. 417, 418 and 419



SCHOOL TABLES 417, 418 AND 419

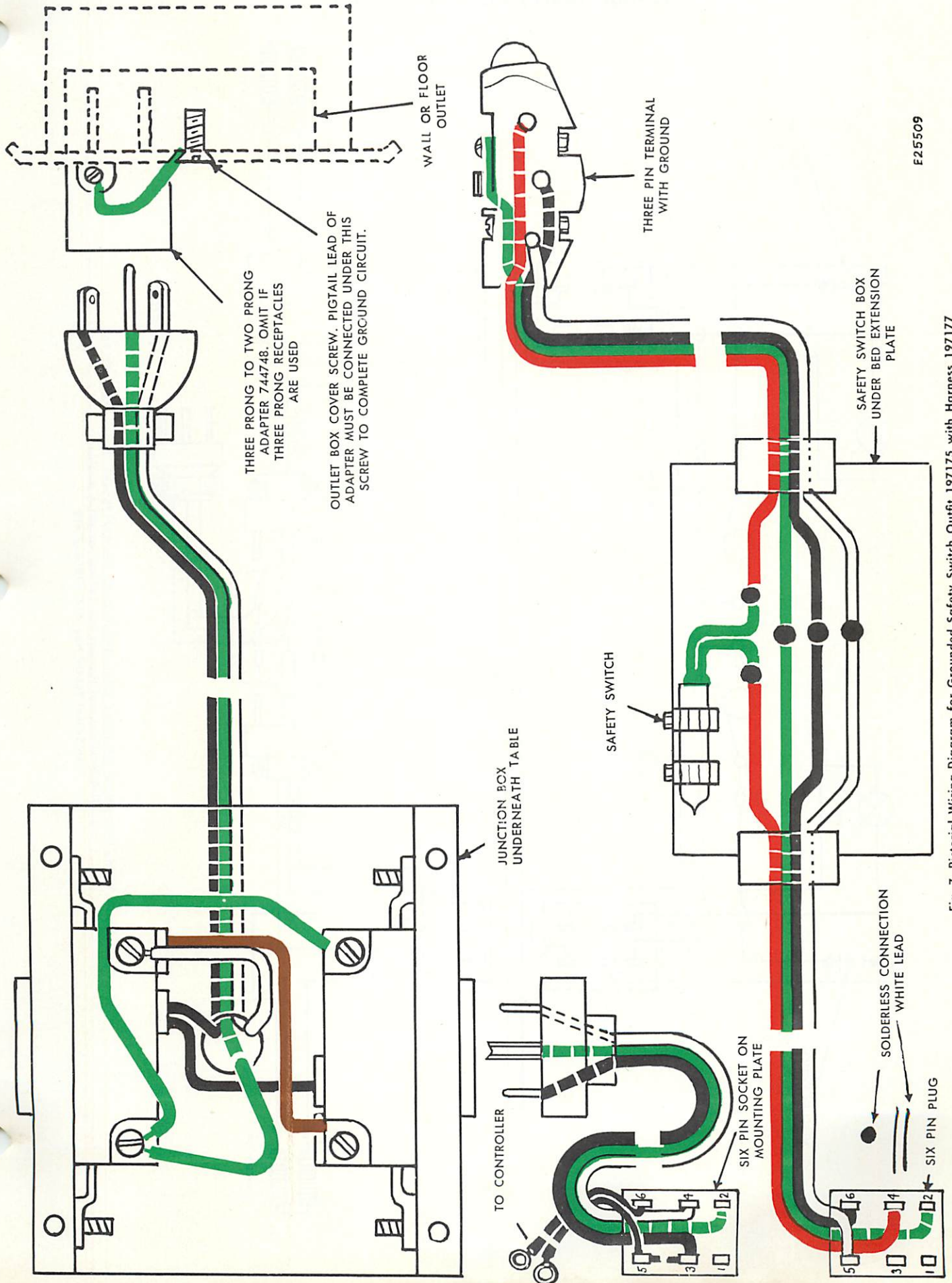


Fig. 7. Pictorial Wiring Diagram for Grounded Safety Switch Outfit 197175 with Harness 197177 for 15-102, 15-126, 66-17, 191J10, 201-5, 201J25, 306-26 and 319-3 Machines on School Tables Nos. 417, 418 and 419

Insert in Form 20596 in place of corresponding Leaf



## SCHOOL TABLES 417, 418 AND 419

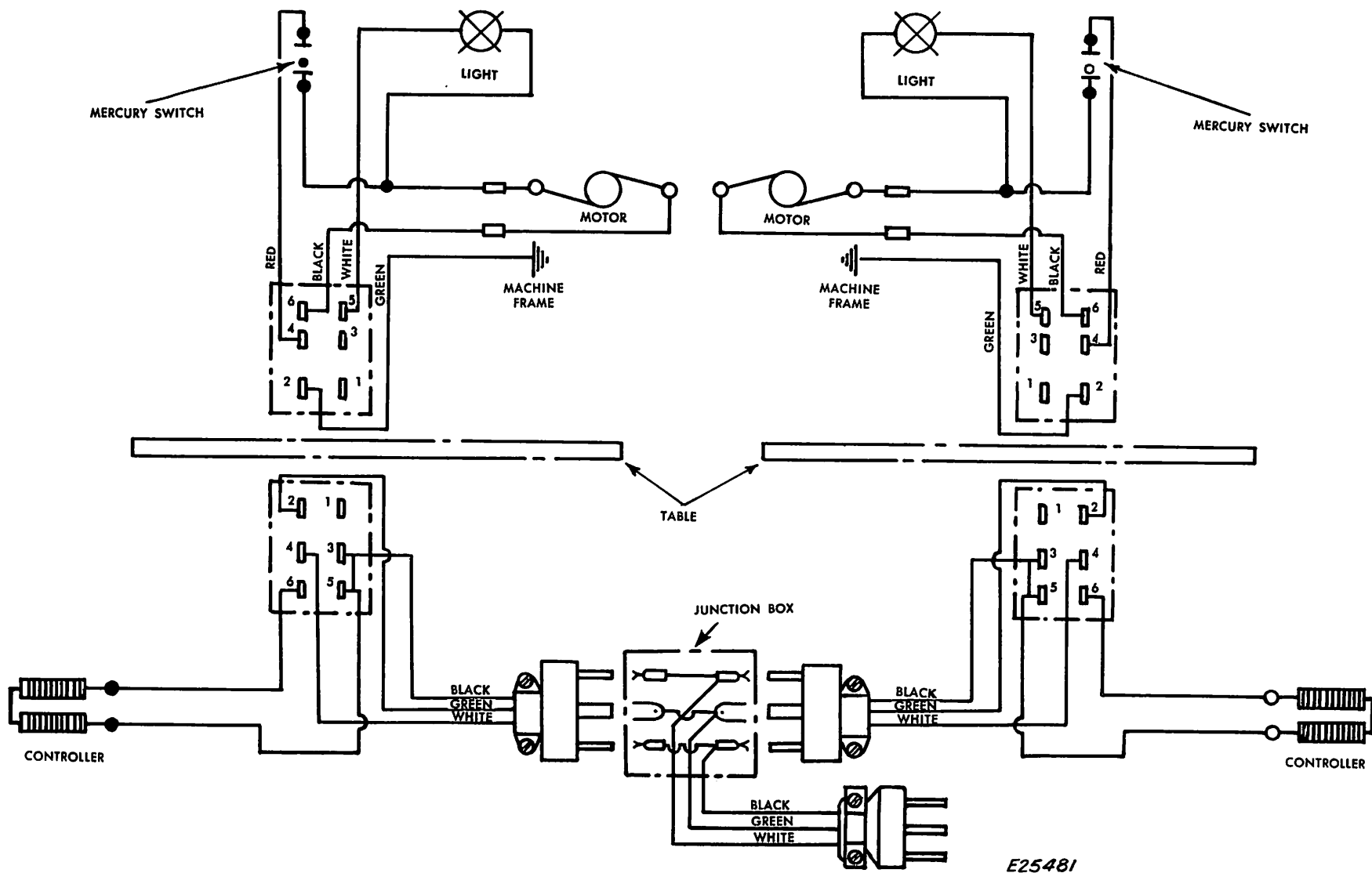


Fig. 8. Wiring Diagram for Grounded Safety Switch Outfit No. 197175 with Harness No. 197176 for 301-4 Machines and Harness No. 197708 for 401-4 Machines on School Tables Nos. 417, 418 and 419

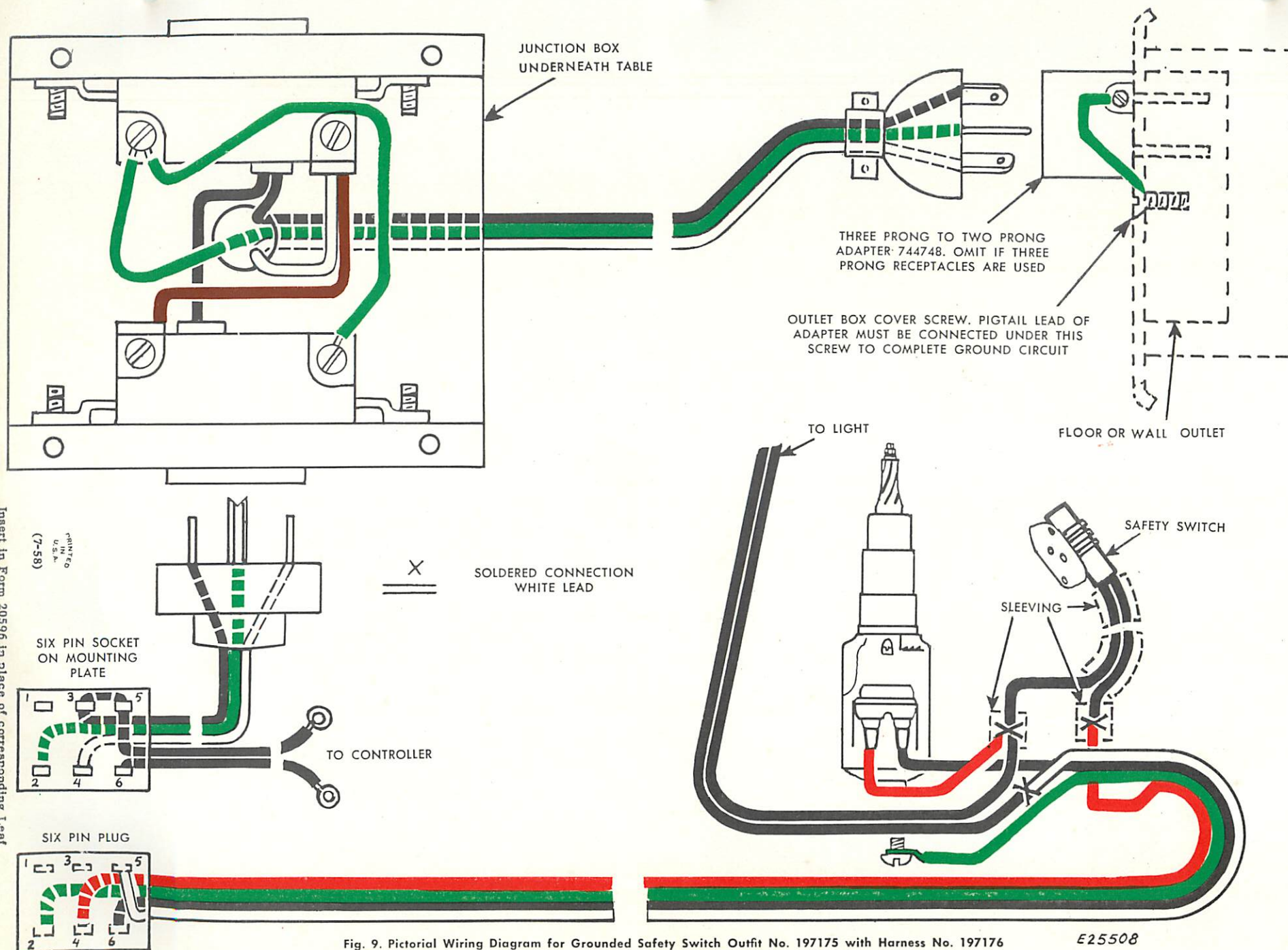


Fig. 9. Pictorial Wiring Diagram for Grounded Safety Switch Outfit No. 197175 with Harness No. 197176 for 301-4 Machines and Harness No. 197708 for 401-4 Machines on School Tables Nos. 417, 418 and 419

E25508

**ELECTRICAL OUTFITS FOR 64" SCHOOL TABLES**

The 64" School Tables are similar to the 417, 418 and 419 School Tables except they are 4" longer and have one drawer and two tote box spaces on each side instead of one drawer and one tote box space on each side. Machines 15-102, 66-17, 201-5, 301-4, 306W26 and 319W3 are used in these School Tables.

The Wiring Outfit, Serial 200564, illustrated on Page 2, is the same as the Wiring Outfit for the 417, 418 and 419 School Tables except one controller has a longer lead from the six-prong socket to the Junction Box, since the Junction Box must be placed near the end of the table instead of at the center.

The Wiring Outfit for the table should be ordered as Serial 200564. This outfit consists of a Junction Box Complete No. 196682, a Controller Complete No. 197179 and a Controller Complete Serial 200563.

Machines should be ordered as 15-102, 66-17, 201-5, 301-4, 306W26 and 319W3. These machines are equipped with the proper Grounded Three-Pin Terminals and Wiring Harnesses to connect to the table outfit and to insure the machine is grounded.

The effectiveness of the ground connection may be easily checked with a two-cell metal case flashlight, as shown on Fig. 4 of Part 3, Section 1.

For parts charts, parts lists and wiring diagrams refer to pages listed below:

Sect. 5, Page 2—Showing Wiring Outfit Serial 200564\*\*

Sect. 2, Page 12—Parts Chart and Parts List for Junction Box Complete No. 196682

Sect. 4, Page 6—Parts Chart for Wiring Harness No. 197177

Sect. 4, Page 7—Parts List for Wiring Harness No. 197177

Sect. 4, Page 8—Schematic Wiring Diagram for Wiring Outfit No. 197175\*\* with Wiring Harness No. 197177

Sect. 4, Page 9—Pictorial Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197177

Sect. 4, Page 10—Schematic Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197176

Sect. 4, Page 11—Pictorial Wiring Diagram for Wiring Outfit No. 197175 with Wiring Harness No. 197176

The only replacement parts available for Wiring Harness No. 197176 are those shown on page 5 of Section 4.

\*\* Wiring Diagram for Grounded Safety Switch Outfit Serial 200564 is the same as for Grounded Safety Switch Outfit No. 197175.

64" SCHOOL TABLES

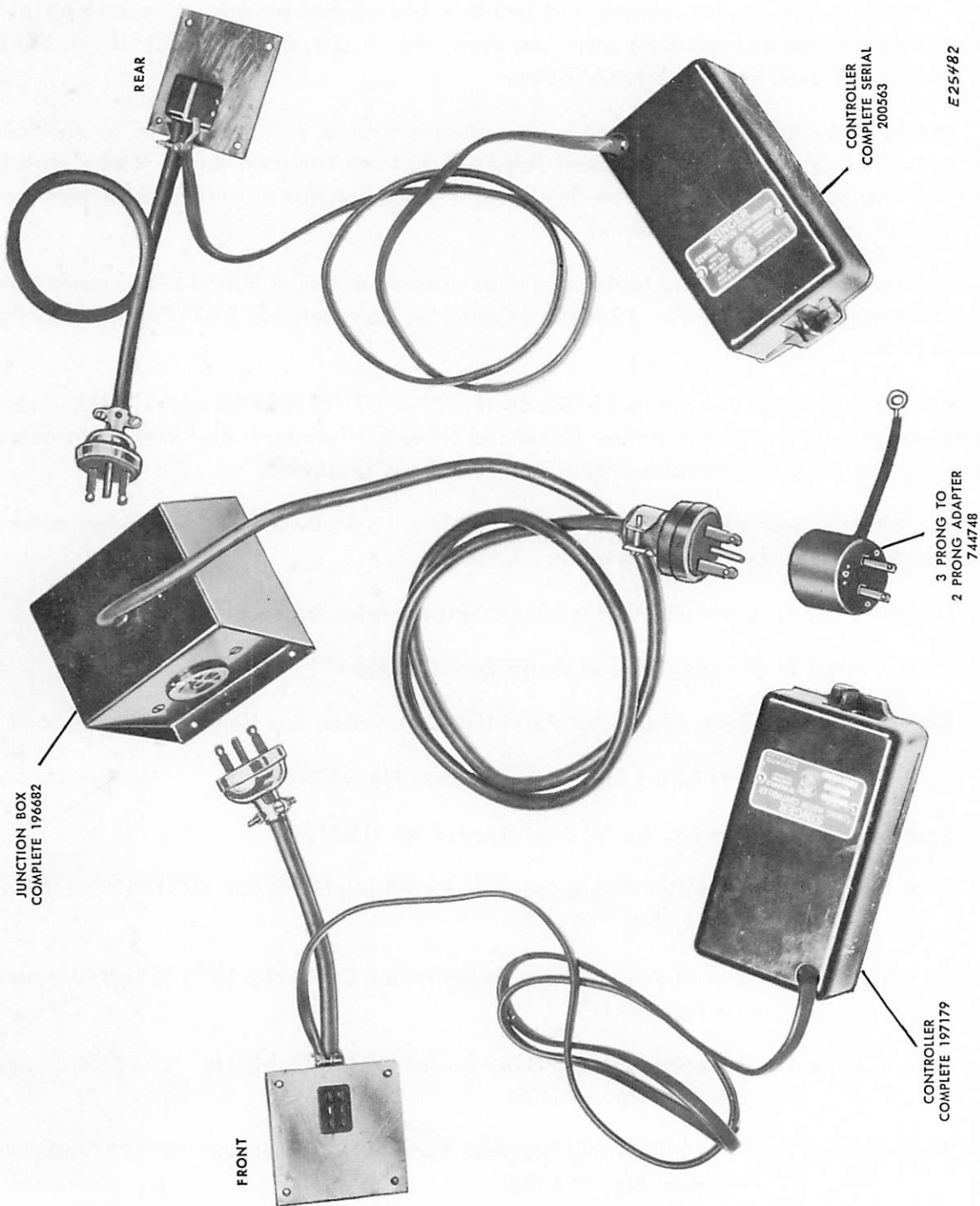


Fig. 1. Wiring Outfit Serial No. 200564 for 64" School Tables

**CONVERSIONS OF SCHOOL TABLES**

It may be desirable, from time to time, to convert School Tables already in the field to applications other than that for which they were originally furnished, such as converting a Non-Grounded No. 409 Table to a Grounded Safety Switch No. 409 Table or converting a No. 411 Table to accommodate a 301-3 Machine. It is the purpose of this section to describe the procedure to be followed in making these conversions.

**In making these conversions, always disconnect the line plug from the wall or floor electric outlet before proceeding with conversion.**

Table of Contents	Page
1. Converting a No. 409 School Table from a Non-Grounded Outfit No. 196671 to a Grounded Safety Switch Outfit No. 196688 .....	2
2. Converting a No. 409 School Table from a Grounded Outfit No. 196681 to a Grounded Safety Switch Outfit No. 196688 .....	4
3. Converting Nos. 409, 411, 412 and 413 School Tables to accommodate a 301-3 Machine .....	5
4. Converting Nos. 410, 414, 415 and 416 School Tables to accommodate 15-91, 66-16, 201-2, 306W25 and 319W2 Machines .....	6
5. Converting Nos. 409 and 410 School Tables to accommodate 15-102, 66-17, 201-5, 301-4, 306W26 and 319W3 Machines .....	7
6. Converting School Tables Nos. 411 to 416 inclusive to School Tables Nos. 417, 418 and 419 .....	8
7. Converting 301-1 and 301-2 Machines to 301-3 Machine .....	8
8. Converting 301-1 and 301-2 Machines to 301-4 Machine .....	9
9. Converting 301-3 Machine to 301-4 Machine .....	10
10. Converting standard 15-91 or 201-2 Machines for use in School Tables Nos. 409 to 416 inclusive .....	10
11. Converting standard 66-16, 306W25 or 319W2 Machines for use in School Tables Nos. 409 to 416 inclusive .....	11
12. Converting standard 15-91 or 201-2 Machines to 15-102 or 201-5 Machines respectively .....	11
13. Converting standard 66-16, 306W25 or 319W2 Machines to 66-17, 306W26 or 319W3 Machines respectively .....	11
14. Converting Grounded Outfit No. 196681 and Grounded Safety Switch Outfit No. 196688 from grounded flat-prong three-pin terminal to grounded round-prong three-pin terminal, including machine .....	11
15. Converting Grounded Safety Switch Outfit No. 196688 from black to beige .....	11

1. **Converting a No. 409 School Table from a Non-Grounded Outfit No. 196671 to a Grounded Safety Switch Outfit No. 196688.** *See Paragraph 1-A for using all new assemblies and Paragraph 1-B for converting old assemblies.*

**1-A** The following new assemblies are required:

One No. 196682 Junction Box Complete (see alternate method)

Two No. 197153 Safety Switch Assembled

One BA5-8 Motor (for 66-16 Machine), or one No. 197151 (for 201-2 Machine) or 197152 (for 15-91 Machine) Grounded Three-Pin Terminal, Male Half (see alternate method)

- 1-A-1. Disconnect two-prong plugs from three-prong receptacles in Junction Box and remove No. 196672 Junction Box Complete from table by removing four wood screws.
- 1-A-2. Install new No. 196682 Junction Box Complete on table with four wood screws in same position which old junction box occupied.
- 1-A-3. Remove four wood screws securing each machine well shield to table and lower shields.
- 1-A-4. Disconnect three-pin terminal, female half, from three-pin terminal, male half, on machine and remove Machine Lead with Bed Extension Plate, No. 196696, from each machine by removing the two No. 160 Screws and No. 90530 Washers.
- 1-A-5. Attach new No. 197153 Safety Switch Assembled to each machine with two No. 160 Screws and No. 90530 Washers
- 1-A-6. Insert three-prong plug (one for each machine) on end of lead from safety switch box into three-prong receptacle in junction box.
- 1-A-7. **66-16 MACHINE**—Remove BA3-8 Motor from machine and install new BA5-8 Motor.  
**15-91 MACHINE**—Remove No. 192797 Three-Pin Terminal, Male Half, from machine and disconnect all leads. Reconnect all leads to new No. 197152 Grounded Three-Pin Terminal, Male Half, refer to Wiring Diagram on Page 20, Part 3, Section 2, and assemble to machine.  
**201-2 MACHINE**—Remove No. 193935 Three-Pin Terminal, Male Half, from machine and install new No. 197151 Grounded Three-Pin Terminal, Male Half, as instructed for 15-91 machine.
- 1-A-8. Reassemble machine well shield to table with original wood screws, being sure controller lead passes through slot in top of left side panel (near front) and controller lead and lead from junction box to safety switch box pass through slot in top of back panel (near right end).



**Converting a No. 409 School Table from a Non-Grounded Outfit No. 196671 to a Grounded Safety Switch Outfit No. 196688. — Continued.**

- 1-A-9. Connect each Grounded Three-Pin Terminal, Female Half, to Grounded Three-Pin Terminal, Male Half, on machine or motor.
- 1-A-10. Insert Three-Prong to Two-Prong Adapter, No. 744748, in wall or floor electric outlet and connect pigtail lead wire of adapter under screw fastening outlet box cover to outlet. Insert three-prong line plug in adapter. If school has three-prong grounded electric outlets discard adapter and insert three-prong line plug in wall or floor outlet.
- 1-B. Alternate Methods—The following parts are required:
  - One No. 196683 Three-Conductor Line Lead with Plug
  - One No. 196684 Jumper Lead with Terminals
  - One No. 744748 Three-Prong to Two-Prong Adapter
  - Two No. 196764 Three-Pin Terminal, Male Half, Ground Contact
  - Two No. 197153 Safety Switch Assembled
- 1-B-1. Convert Junction Box Complete No. 196672 to Junction Box Complete No. 196682 as follows:
  - 1-B-1-a. Disconnect two-prong plugs from three-prong receptacles in junction box and remove No. 196672 Junction Box Complete from table by removing four wood screws.
  - 1-B-1-b. Disconnect line lead from three-prong receptacle in junction box.
  - 1-B-1-c. Remove strain relief from junction box by squeezing the two halves together with pliers and pulling out of box at same time and remove line lead from junction box.
  - 1-B-1-d. Assemble strain relief over new No. 196683 Three-Conductor Line Lead (on end without plug) so that approximately 1/2" of lead with outer insulation jacket extends beyond strain relief. The smaller portion of the strain relief should be toward the end of the lead.
  - 1-B-1-e. Insert ends of line lead in hole in junction box and push strain relief into hole until undercut in strain relief engages hole in box locking it in place.
  - 1-B-1-f. Connect line lead to three-prong receptacle and new No. 196684 Jumper Lead with Terminals to the ground terminal on the two three-prong receptacles. Be sure the other two jumper leads are connected to both three-prong receptacles, see wiring diagram on Page 21, Part 3, Section 2.
  - 1-B-1-g. Reassemble junction box, now converted to Junction Box No. 196682, to table with original four wood screws in same position it originally occupied.
- 1-B-2. Follow 1-A-3 to 1-A-6 inclusive, see page 2.

**Converting a No. 409 School Table from a Non-Grounded Outfit No. 196671 to a Grounded Safety Switch Outfit No. 196688. — Continued.**

- 1-B-3. If machines on table are **15-91** or **201-2**, convert Three-Pin Terminal, Male Half Nos. 192797 or 193935 respectively to Three-Pin Terminal, Male Half, Nos. 197152 or 197151 respectively as follows:
- 1-B-3-a. Remove screw fastening three-pin terminal, male half, to machine.
  - 1-B-3-b. Assemble new No. 196764 Three-Pin Terminal, Male Half, Ground Contact under head of screw.
  - 1-B-3-c. Replace screw.
- 1-B-4. If machines on table are **66-16** or **306W25**, convert BA3-8 Motor to BA5-8 Motor as follows:
- 1-B-4-a. Convert to grounded three-pin terminal, male half, according to Paragraph 1-B-3 above.
  - 1-B-4-b. Remove film of paint from raised oval face (boss) around motor mounting screw slot on motor bracket, see Fig. 1, using emery cloth with light pressure strokes. Be sure to remove all paint from this boss to secure a good ground connection.

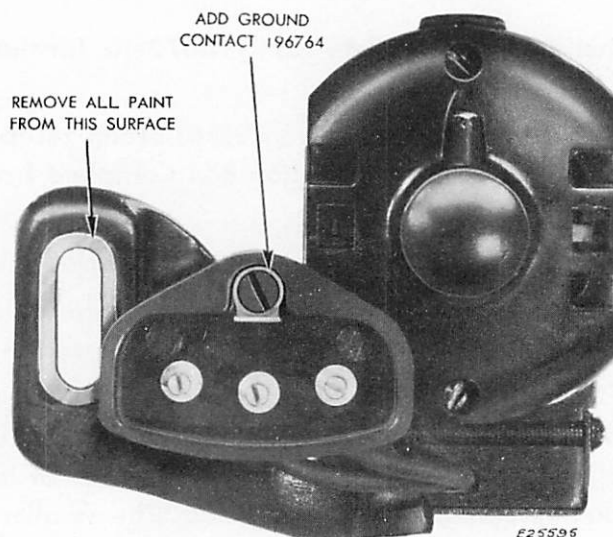


Fig. 1. Converting BA3-8 Motor to BA5-8 Motor

- 1-B-5. Follow Paragraphs 1-A-8, 1-A-9 and 1-A-10, see pages 2 and 3.
2. **Converting a No. 409 School Table from a Grounded Outfit No. 196681 to a Grounded Safety Switch Outfit No. 196688.**

Two No. 197153, Safety Switches Assembled, are required.

- 2-1. Remove four wood screws securing each machine well shield to table and lower shield.
- 2-2. Disconnect three-prong plug from three-prong receptacle in junction box and three-pin terminal, female half, from three-pin terminal, male half, on machine and remove Machine Lead with Bed Extension Plate, No. 196685 from each machine by removing the two No. 160 Screws and No. 90530 washers securing the plate to the machine bed.

**Converting a No. 409 School Table from a Grounded Outfit No. 196681 to a Grounded Safety Switch Outfit No. 196688. — Continued.**

- 2-3. Install new No. 197153 Safety Switch Assembled to each machine with two No. 160 Screws and No. 90530 Washers.
- 2-4. Connect three-prong plug into three-prong receptacle in junction box and Three-Pin Terminal, Female Half, to Three-Pin Terminal, Male Half, on Machine or Motor.
- 2-5. Reassemble machine well shield to table with original wood screws, being sure controller lead passes through slot in top of left side panel (near front) and controller lead and lead from junction box to safety switch box pass through slot in top of back panel (near right end).

**3. Converting Nos. 409, 411, 412 and 413 School Tables to accommodate a 301-3 Machine.**

The following new assemblies are required:

- One No. 196897 Controller Complete
- One No. 196907 Lead Retaining Strip
- One No. 170112 Cradle Complete

Double above quantities if both sides of table are to be converted. If table is No. 409 with Non-Grounded Outfit No. 196671 a new Junction Box No. 196682 is required, see Paragraphs 1-A-1, 1-A-2 and 1-A-10, see pages 2 and 3.

- 3-1. Remove controller lead clamps by removing wood screws securing them to machine well shield.
- 3-2. Remove four wood screws securing machine well shield to table and lower shield.
- 3-3. Disconnect machine lead from junction box and controller lead from three-pin terminal, male half, on machine or motor and remove sewing machine.
- 3-4. Remove controller from table as follows:
  - 3-4-a. Remove four wood screws securing controller bracket to table.
  - 3-4-b. Disconnect controller from knee lever mechanism.
  - 3-4-c. Remove two screws fastening controller bracket to controller.
- 3-5. Assemble new No. 196897 Controller Complete to table reversing the procedure of Paragraph 3-4 above.
- 3-6. Reassemble machine well shield to table with original wood screws, being sure controller lead passes through slot in top of left side panel (near front) and controller lead and lead to junction box pass through slot in top of back panel (near right end) with six-prong socket inside well and three-prong plug outside.
- 3-7. Reassemble controller lead clamps in original positions with original screws clamping controller lead to shield.



**Converting Nos. 409, 411, 412 and 413 School Tables to Accommodate a 301-3 Machine--Continued.**

- 3-8. Install Machine Cradle No. 170112 and set 301-3 machine in cradle.
  - 3-9. Connect three-prong plug to three-prong receptacle in junction box and six-prong socket to six-prong plug on machine.
  - 3-10. Slip Lead Retaining Strip, No. 196907, over both leads from six-prong socket, slide one end of lead retaining strip through slot in projection on bottom of machine cradle and twist ends tightly together to retain leads and prevent damage to leads or plugs when machine is raised and lowered.
4. **Converting Nos. 410, 414, 415 and 416 School Tables to accommodate 15-91, 66-16, 201-2, 306W25 and 319W2 Machines. Machines must be ordered as specified on Pages 1 and 2 of Part 3, Section 3.**

The following new assemblies are required:

One No. 196698 Controller Complete

One No. 197153 Safety Switch Assembled

Double above quantities if both sides of table are to be converted.

- 4-1. Remove controller lead clamps by removing wood screws securing them to machine well shield.
- 4-2. Remove four wood screws securing each machine well shield to table and lower shield.
- 4-3. Disconnect six-prong socket from six-prong plug on machine and three-prong plug from three-prong receptacle in junction box and remove lead retaining strip.
- 4-4. Remove controller from table as follows:
  - 4-4-a. Remove four wood screws securing controller bracket to table.
  - 4-4-b. Disconnect controller from knee lever mechanism.
  - 4-4-c. Remove two screws fastening controller bracket to controller.
- 4-5. Assemble new No. 196698 Controller Complete to table reversing the procedure of Paragraph 4-4 above.
- 4-6. Remove 301-3 Machine with No. 170112 Cradle Complete from table.
- 4-7. Assemble new No. 197153 Safety Switch Assembled to new machine which must be ordered according to instructions on Pages 1 and 2 of Part 3, Section 3.
- 4-8. Assemble machine to table.
- 4-9. Connect controller lead to grounded three-pin terminal, male half, on machine or motor, see wiring diagram on Page 20 of Part 3, Section 2.

**Converting Nos. 410, 414, 415 and 416 School Tables to Accommodate 15-91, 66-16, 201-2, 306W25 and 319W2 Machines. — Continued.**

- 4-10. Connect three-pin terminal, female half, to three-pin terminal, male half, on machine or motor and three-prong plug to three-prong receptacle in junction box.
- 4-11. Reassemble machine well shield to table with original wood screws, being sure controller lead passes through slot in top of left side panel (near front) and controller lead and lead from junction box to safety switch box pass through slot in top of back panel (near right end).
- 4-12. Reassemble controller lead clamps in original position with original screws clamping controller lead to outside of machine well shield.

**5. Converting Nos. 409 and 410 School Tables to accommodate 15-102, 66-17, 201-5, 301-4, 306W26 and 319W3 Machines.**

The following new assemblies are required to convert both sides of table:  
Two No. 197179 Controller Complete

This conversion does not convert the Nos. 409 and 410 School Tables to a No. 417 School Table because of the mechanical construction of the tables, but does convert the tables to use the machines adopted for the 417 table.

If table being converted is No. 409 with Non-Grounded Outfit No. 196671, a new Junction Box Complete No. 196682 is required, see Paragraphs 1-A-1, 1-A-2 and 1-A-10, see pages 2 and 3.

- 5-1. Remove controller lead clamps by removing wood screws securing them to machine well shield.
- 5-2. Remove four wood screws securing machine well shield to table and lower shield.
- 5-3. **For 15-91, 66-16 and 201-2 MACHINES**, disconnect controller lead from three-pin terminal, male half, on machine or motor and three-prong plug from three-prong receptacle in junction box and remove machine from table.  
**For 301-3 MACHINE**, disconnect six-prong socket from six-prong plug on machine and three-prong plug from three-prong receptacle in junction box and remove machine and cradle complete from table.
- 5-4. Remove controller from table as follows:
  - 5-4-a. Remove four wood screws securing controller bracket to table.
  - 5-4-b. Disconnect controller from knee lever mechanism.
  - 5-4-c. Remove two screws securing controller bracket to controller.
- 5-5. Assemble new No. 197179 Controller Complete to table reversing the procedure of Paragraph 5-4.
- 5-6. Drill 2-1/2" Diameter hole in back panel of machine well shield with center of hole 3" up from bottom and 2-1/4" from right side panel.
- 5-7. Assemble six-prong socket with mounting plate over 2-1/2" dia. hole with wood screws. This should be positioned so that six-prong socket is vertically centered in the lower half of the hole.

**Converting Nos. 409 and 410 School Tables to Accommodate 15-102, 66-17, 201-5, 301-4, 306W26 and 319W3 Machines. — Continued.**

- 5-8. Reassemble machine well shield to table with original wood screws, being sure controller lead passes through slot in top of left side panel (near front).
- 5-9. Reassemble controller lead clamps in original position with original screws clamping controller lead to outside of machine well shield.
- 5-10. Connect three-prong plug to three-prong receptacle in junction box.
- 5-11. **MACHINES 15-102, 66-17, 201-5, 306W26 and 319W3** are equipped with grounded three-pin terminal and safety switch assembled. Attach safety switch assembled to machine bed with two No. 160 screws and No. 90530 washers. Connect three-pin terminal, female half, to three-pin terminal, male half, on machine or motor. Assemble machine to table.  
**MACHINE 301-4** is equipped with a wiring harness having a lead with six-prong plug extending from machine and a cradle complete No. 170112. Assemble machine and cradle to table.
- 5-12. Connect six-prong plug to six-prong socket mounted on back panel of machine well shield.
- 5-13. Fasten strain relief clamp to back panel of machine well shield with small wood screw directly above 2-1/2" diameter hole.

**6. Converting School Tables Nos. 411 to 416 inclusive to School Tables Nos. 417, 418 and 419.**

School Tables Nos. 411 and 414 can be converted to School Table No. 417.

School Tables Nos. 412 and 415 can be converted to School Table No. 418.

School Tables Nos. 413 and 416 can be converted to School Table No. 419.

To make these conversions follow instructions in Paragraph 5, see pages 7 and 8.

**7. Converting 301-1 and 301-2 Machines to 301-3 Machine.**

One Wiring Harness No. 196929 is required.

- 7-1. Remove arm top cover complete and bed cover plate.
- 7-2. Remove motor hold-down plate by removing one screw securing it to machine bed. Remove motor leads from motor and slide motor out of machine.
- 7-3. Remove two screws fastening three-pin terminal, male half, to machine.
- 7-4. Remove two screws fastening two-pin socket to feed rock shaft clearance hole cover plate. Omit this item for 301-2 Machine.
- 7-5. Remove feed rock shaft clearance hole cover plate by removing two screws securing it to machine bed.



**Converting 301-1 and 301-2 Machines to 301-3 Machine. — Continued.**

- 7-6. Disconnect light lead from wiring harness by removing two screw type solderless connectors and separating leads.
- 7-7. Remove wiring harness from machine by pulling entire harness through three-pin terminal opening.
- 7-8. Install new Wiring Harness No. 196929 as follows:
  - 7-8-a. Remove rating plate and gasket from safety switch.
  - 7-8-b. Slide light lead, motor leads and safety switch through feed rock shaft clearance hole and fasten six-prong plug with mounting plate to machine bed, in position previously occupied by feed rock shaft clearance hole cover plate, with same screws which secured previous plate.
  - 7-8-c. Thread light lead of harness through machine to top and connect to lead from light with previously removed screw type solderless connectors.
  - 7-8-d. Place gasket over inside (bracket side) of rating plate. Push safety switch up in arm until opposite three-pin terminal opening and snap on brackets on rating plate. Position gasket so that the two screw holes are over the screw holes in arm (gasket outside pads) and push ends inside arm so they overlap opening. Place rating plate in position and secure with same screws which originally secured three-pin terminal.
- 7-9. Slide motor into position in machine, rocking it back and forth if necessary to engage gears. Connect motor leads to pins on motor. Place motor hold down plate in position and fasten with previously removed screw.
- 7-10. Reassemble arm top cover complete and bed cover plate.

**8. Converting 301-1 and 301-2 Machines to 301-4 Machine.**

One No. 197176 Wiring Harness and One No. 170112 Cradle Complete are required.

- 8-1. Follow Paragraphs 7-1 to 7-7 inclusive, see pages 8 and 9.
- 8-2. Install new Wiring Harness No. 197176 as follows:
  - 8-2-a. Remove rating plate and gasket from safety switch.
  - 8-2-b. Slide light lead, motor leads and safety switch through feed rock shaft clearance hole and fasten feed rock shaft clearance hole cover plate to bed with two screws previously removed. Fasten strain relief clamp on lead under the lower of the two screws attaching the plate. Note that lead must make sharp right angle bend, and lead should be clamped so

**Converting 301-1 and 301-2 Machines to 301-4 Machine. — Continued.**

that this bend is as sharp as possible. Be sure that about a half an inch of the lead with outer jacket extends inside the sewing machine.

8-2-c. Follow Paragraphs 7-8-c and 7-8-d, see page 9.

8-3. Follow Paragraphs 7-9 and 7-10, see page 9.

**9. Converting a 301-3 Machine to a 301-4 Machine**

One No. 197176 Wiring Harness is required.

- 9-1. Remove arm top cover complete and bed cover plate from machine.
- 9-2. Remove motor hold down plate by removing one screw securing it to machine bed. Disconnect motor leads from motor. Slide motor out of machine.
- 9-3. Remove two screws securing rating plate to machine. Snap safety switch out of brackets. Remove rating plate and gasket from machine.
- 9-4. Remove two screws securing six-prong plug with mounting plate to machine bed.
- 9-5. Disconnect light lead from wiring harness by removing two screw type solderless connectors and separating leads.
- 9-6. Remove wiring harness from machine by pulling entire harness through feed rock shaft clearance hole.
- 9-7. Install new Wiring Harness No. 197176 according to instructions in Paragraphs 8-2 and 8-3, see pages 9 and 10.

**10. Converting standard 15-91 or 201-2 Machines for use in School Tables Nos. 409 to 416 inclusive.**

The following parts are required:

One No. 197153 Safety Switch Assembled.

One No. 197152 (for 15-91) or No. 197151 (for 201-2) Grounded Three-Pin Terminal.

- 10-1. Drill and tap machine bed to receive bed extension plate.
- 10-2. Remove three-pin terminal, male half, from machine by removing fastening screw and disconnect all leads after removing three thumb nuts.
- 10-3. Connect leads to new No. 197152 (for 15-91) or 197151 (for 201-2) Grounded Three-Pin Terminal, Male Half, and fasten terminal to machine with screw previously removed.
- 10-4. Attach No. 197153 Safety Switch Assembled to machine with two No. 160 screws and 90530 washers.
- 10-5. Connect grounded three-pin terminal, female half, on safety switch, assembled to grounded three-pin terminal, male half, on machine.

NOTES: Three-pin terminals Nos. 192797 and 193935 can be converted to grounded three-pin terminals Nos. 197152 and 197151 respectively, see Paragraph 1-B-3, page 4. If Table is No. 409 with Non-Grounded Outfit No. 196671, convert table, see Paragraph 1, page 2. If table is No. 410, 414, 415 or 416, convert table, see Paragraph 4, page 6.

**11. Converting standard 66-16, 306W25 or 319W2 Machines for use in School Tables Nos. 409 to 416 inclusive.**

The following parts are required:

One BA5-8 Motor

One No. 197153 Safety Switch Assembled

11-1. Drill and tap machine bed to receive bed extension plate. Not required on 306W25 and 319W2 Machines as they are already tapped.

11-2. Remove BA3-8 Motor from machine and install new BA5-8 Motor.

11-3. Follow Paragraphs 10-4 and 10-5, see page 10.

NOTE: The BA3-8 Motor can be converted to a BA5-8 Motor, see Paragraph 1-B-4, Page 4.

If Machine is 306W25 Beige, convert No. 196688 Safety Switch Assembled to beige, see Part 3, Section 3, Pages 2 and 3. See also notes under Paragraph 10, page 10.

**12. Converting standard 15-91 or 201-2 Machines to 15-102 or 201-5 Machines respectively.**

The following parts are required:

One No. 197177 Wiring Harness

One No. 197152 (for 15-91) or No. 197151 (for 201-2) Grounded Three-Pin Terminal

This conversion is the same as that described in Paragraph 10, see page 10, except Wiring Harness No. 197177 is installed on machine.

**13. Converting standard 66-16, 306W25 or 319W2 Machines to 66-17, 306W26 or 319W3 Machines respectively.**

The following parts are required:

One BA5-8 Motor

One No. 197177 Wiring Harness

This conversion is the same as that described in Paragraph 11 above except Wiring Harness No. 197177 is installed on machine.

**14. Converting Grounded Outfit No. 196681 and Grounded Safety Switch Outfit No. 196688 from grounded flat prong three-pin terminal to grounded round prong three-pin terminal, including machine.**

The following parts are required:

One No. 196763 Grounded Three-Pin Terminal, Female Half.

One No. 197152 (for 15-91, 66-16 or 306W25) or No. 197151 (for 201-2) Grounded Three-Pin Terminal, Male Half.

To make this conversion see instructions in Part 3, Section 2, Pages 9 and 10.

**15. Converting Grounded Safety Switch Outfit No. 196688 from black to beige.**

One No. 197244 Beige Conversion Kit is required.

To make this conversion see instructions in Part 3, Section 3, Pages 2 and 3.

## TO ELIMINATE MECHANICAL NOISE IN BA MOTORS

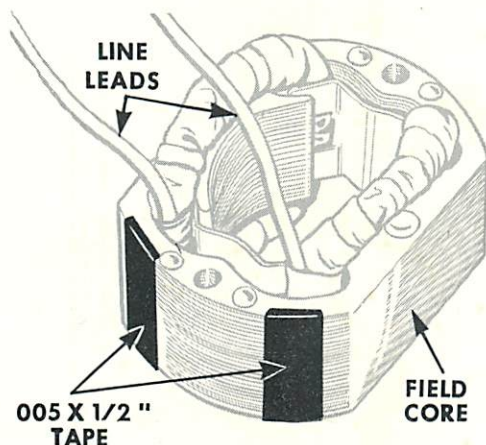


Fig. 1

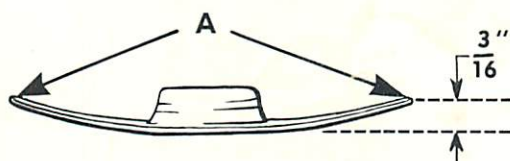


Fig. 2

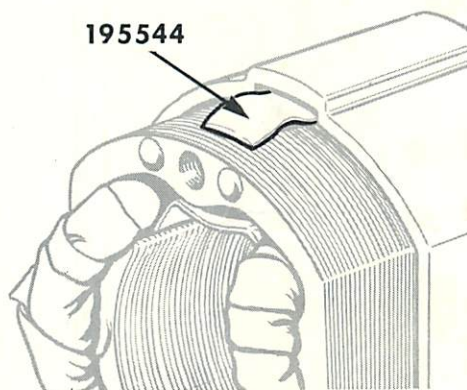


Fig. 3

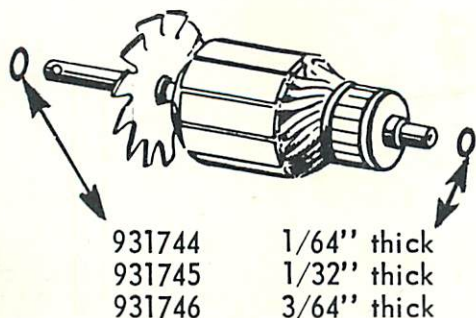


Fig. 4

## 1. UNDERSIZE FIELD CORE

When field core is loose within its covers, use Scotch Electrical Tape No. 33, 1/2" wide x .005" thick (or its equivalent but do not use ordinary friction tape). Place tape on bottom of core (only at end where leads extend) and wrap 1/8" length over each edge for security, as illustrated in Fig. 1.

## 2. WEAK BEARING RETAINERS

Remove bearing retainers from each cover for comparison with a new counterpart, which will have a minimum dimension of 3/16" from the spring tips (A, Fig. 2) to the bottom of the spring, as illustrated. If the tips are below this dimension, install a new retainer.

## 3. TIGHT WEDGE SPRING

A small wedge, Part No. 195544, (Fig. 3) is installed between the two end covers so that it presses against the field core. This wedge absorbs the vibrations normally present in motor operation and should be replaced carefully when the motor end covers are reassembled. The spring edges must be free to maintain the spring action during operation of the motor. Sometimes, in a new motor, the edges will lock in the corners, thus preventing the spring from acting as it normally should.

## 4. EXCESSIVE ARMATURE END PLAY

Armatures of bracket type motors should have a slight (approximately 1/32 inch) of end play for proper operation. Excessive end play can be taken up by means of thrust washers:

931744	1/64" thick
931745	1/32" thick
931746	3/64" thick

These washers may be mounted on either *end of the* armature shaft, as shown in Fig. 4, keeping in mind proper carbon brush location on armature and cooling fan clearance and that the armature shaft turns freely.

**PA2 MOTOR FOR CLASS 301 MACHINE**

The PA2 Motor is a series commutator type electric motor designed especially for use with the Class 301 Machine. A general description of the Series Commutator type electric motor with suggestions for servicing will be found in Part 1, Section 2 of this Manual.

The PA2 Motor is arranged to be mounted within the arm of the sewing machine in an upright position. A worm on the end of the extended shaft engages a worm wheel on the arm shaft to drive the sewing machine. The motor is held in place by a pressed sheet metal plate fastened to the bed of the machine. This plate also serves as a cover to protect the electrical wiring and connections.

Electrical connection is made to the motor by means of two leads with female spring terminals which fit over two male connection terminals on the commutator end cover of the motor. The female connection terminals are insulated with a plastic cap and are removed from the motor simply by pulling them off. When reinstalling the motor, connection is made by pushing these terminals onto the motor connection pins and care should be taken that they are pushed fully home before the motor fastening plate is installed.

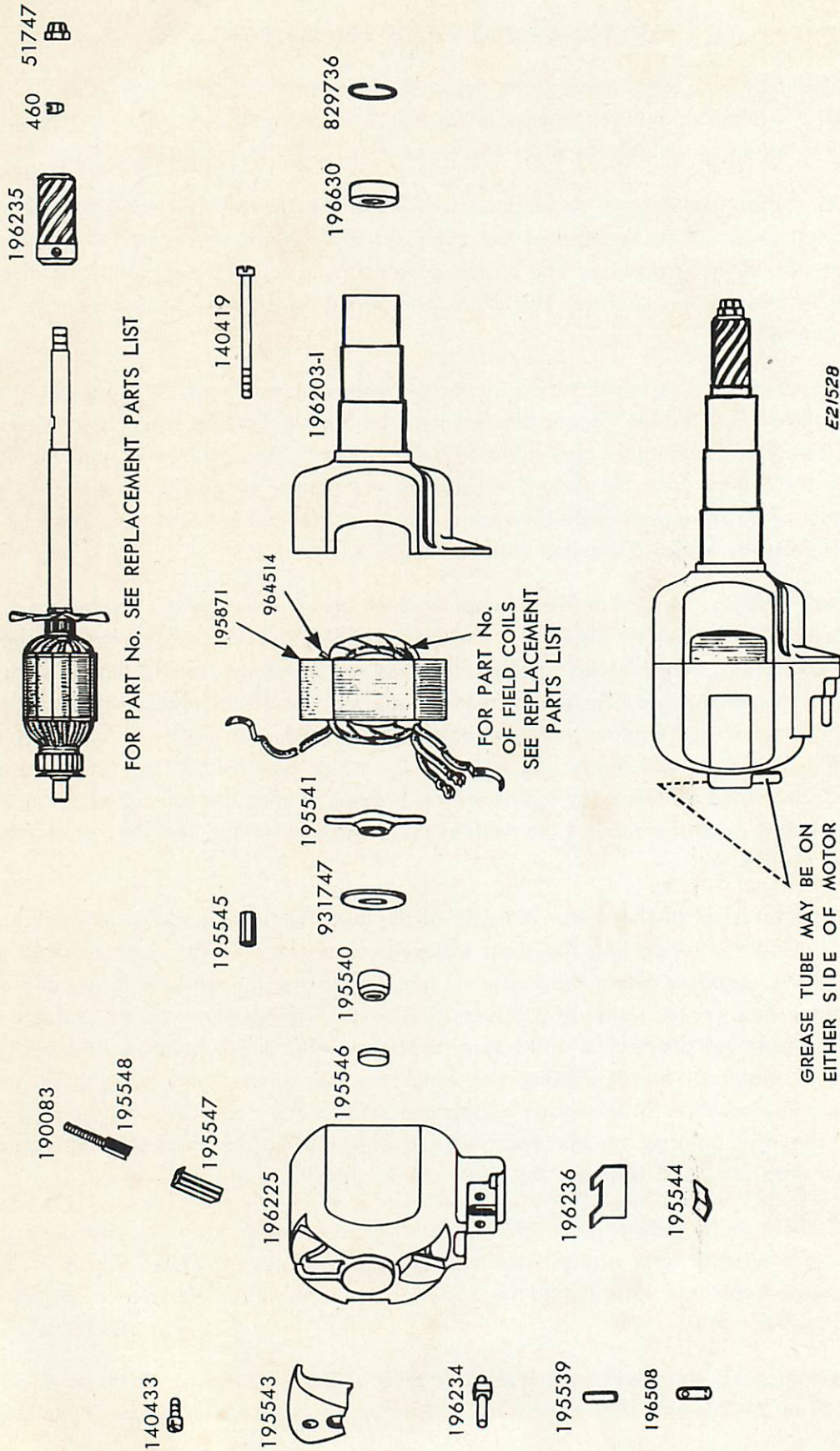
The brush rigging consists of the normal carbon brush with spring, housed in a hollow pressed brass brush box which fits into a slot in the molded bakelite end cover beneath the brush caps. The bakelite brush cap may be removed by loosening the fastening screw which holds it in place, and the brush box may then be slipped out for inspection or replacement of the brushes. The electrical contact with the brush box is made by means of a spring terminal clip soldered to the field coil leads and engages the brush box through a slot in the bakelite end cover. Care should be taken in replacing the brushes so that the brush box fits properly in the place provided, with the tab on the end of the brush box fitting into the recess cast in the end cover to receive it.

The shaft end cover of the motor is made of die cast aluminum and houses in its extended hub a ball bearing for supporting the shaft adjacent to the worm. This ball bearing supports the weight of the armature when the motor is mounted in the machine in its upright position. The commutator end cover, which also houses the brush rigging, is made of molded bakelite because of its insulating properties, and houses a self-aligning sleeve bearing. This bearing may be replaced, if required, by depressing the wings on the sheet metal bearing retainer and turning it counter clockwise to disengage it from the slots in the end cover which normally hold it in place. The ball bearing on the opposite end of the armature shaft may be replaced by removing the snap ring and pressing the shaft out through the bearing.

A small sheet metal wedge Part 195544 is installed between the two end covers so that the edges of the wedge press against the field core. This serves to absorb vibrations normally present in motor operation and should be replaced carefully when the motor end covers are reassembled to the motor.

Replacement parts chart will be found on Page 2, replacement parts list is on Page 3, and a wiring diagram of the electrical apparatus for the 301 machine will be found on Page 4.





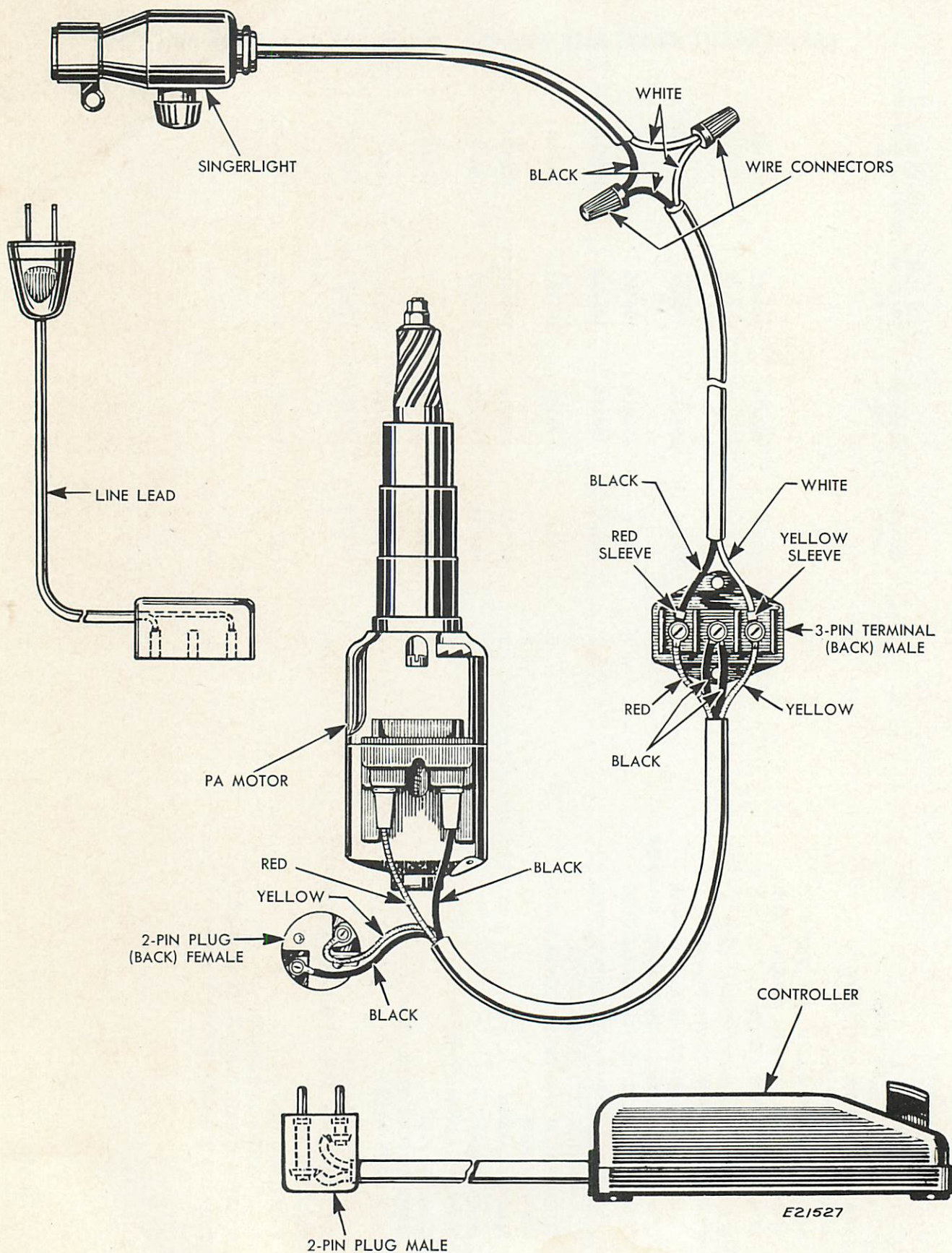
PA2 MOTOR FOR CLASS 301 MACHINE



## REPLACEMENT PARTS LIST FOR PA2 MOTOR FOR CLASS 301 MACHINE

PART No.	DESCRIPTION	QUAN.	CATALOG No.	ARMATURE No.	FIELD CORE WITH COILS No.	FIELD CORE WITH TERMINALS AND LUGS No.
**	ARMATURE WOUND WITH FAN	1				
196235	ARMATURE SHAFT PINION	1				
460	ARMATURE SHAFT PINION SET SCREW	1				
51747	ARMATURE SHAFT PINION LOCKING NUT	1				
196225	COMMUTATOR END COVER	1	PA2-1	196411	196422	196433
195546	COMMUTATOR END COVER FELT DISC	1	PA2-3	196412	196423	196434
195540	COMMUTATOR END COVER BEARING	1				
931747	COMMUTATOR END COVER FELT WASHER	1	PA2-5	196413	196424	196435
195541	COMMUTATOR END COVER BEARING RETAINER	1				
196508	COMMUTATOR END COVER GREASE TUBE	1	PA2-6	196414	196425	196436
195539	COMMUTATOR END COVER GREASE WICK	1	PA2-7	196415	196426	196437
195543	COMMUTATOR END BRUSH COVER	2	PA2-8	196252	196253	196254
140433	COMMUTATOR END BRUSH COVER SCREW	2				
195547	BRUSH HOLDER	2				
195548	BRUSH — CARBON	2	PA2-9	196416	196427	196438
190083	BRUSH SPRING	2	PA2-10	196417	196428	196439
195545	THREADED SCREW COUPLING	2				
196234	TERMINAL POST	2	PA2-11	196418	196429	196440
196236	TERMINAL POST INSULATION	1				
195544	FIELD CORE WEDGE	1	PA2-12	196419	196430	196441
195871	FIELD CORE, COMPLETE	1	PA2-14	196420	196431	196442
**	SET FIELD COILS WITH TERMINALS AND LUGS	1				
964514	FIELD COIL WEDGE	2				
196203	PULLEY END HOUSING	1	PA2-15	196421	196432	196443
196630	PULLEY END BALL BEARING	1				
829736	PULLEY END BALL BEARING SNAP RING	1				
140419	PULLEY END HOUSING FAST'G SCREW	2				

\*\* See listing under Catalog No.



WIRING DIAGRAM FOR CLASS 301 MACHINE



**WIRING HARNESS AND LINE LEAD FOR CLASS 301 MACHINE**

The motor connection plugs and SINGERLIGHT are designed as integral parts of the Class 301 Machine. Electrical connections between these parts are made by means of a wiring harness, with plugs, as illustrated on the Service Parts Chart shown on Page 6.

The line lead consists of a length of two conductor cord with a standard flat prong male line plug at one end, and a three pin female terminal plug at the other end. For the regular line lead, the center pin of this three pin female plug has no electrical connection.

The male three pin plug has been designed to fit in a recess in the arm of the machine, and has connected to its rear terminals a two conductor lead threaded up through the arm of the machine for connection to the SINGERLIGHT. This two conductor lead terminates in stripped ends which are connected to the similar stripped ends of the SINGERLIGHT lead by means of solderless wire connectors. These connections fit in a cavity, in the top of the machine arm, and the lead is protected from the moving parts of the machine by means of a sheet metal guard.

Also connected to the back of the three pin male terminal in the arm of the machine are four single leads sheathed in a piece of plastic insulating tubing; two of these leads terminate in individual female connection plugs which make electrical connection to the motor terminals; the other two leads terminate in a two pin female plug fastened in the bed of the machine for connection to the controller.

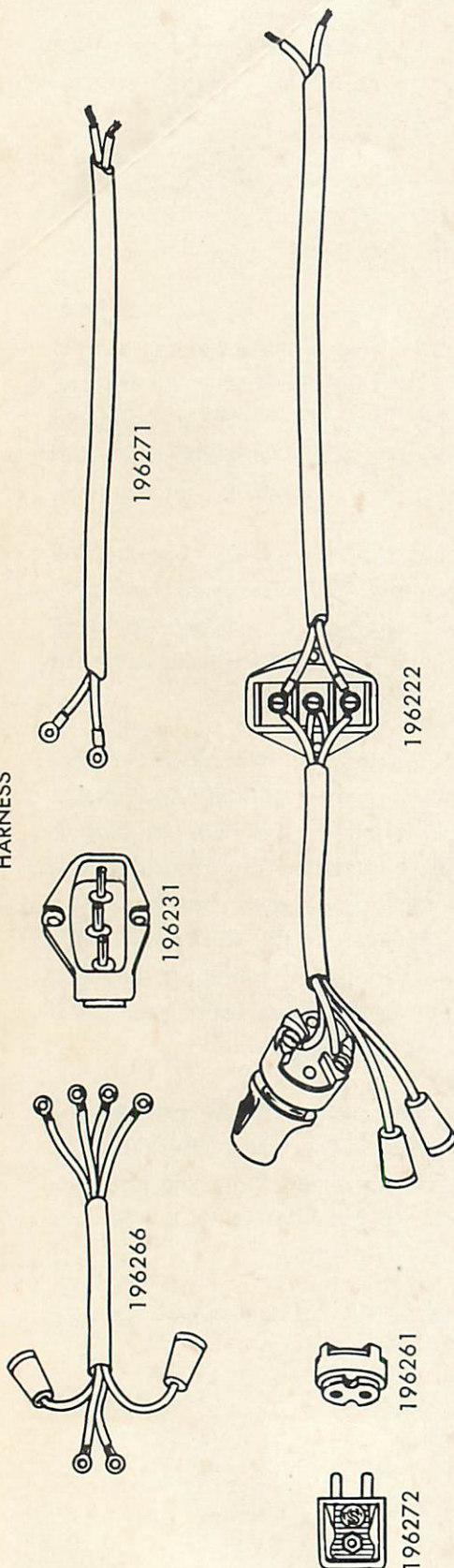
Shipped with each machine is a two pin male plug without leads. This two pin male plug is arranged to take the lead from the standard controller in the machine cabinet, and should be connected by the Agency when the machine is installed in its cabinet. The two pin plug is disassembled by removing the fastening screw, and the eyeletted leads on the controller are fastened to each of the two terminal posts, by means of the fastening screws provided. The sides of this plug, where the lead exits from it, are slotted and the walls of the slot are serrated to provide a strain relief for the lead insulation. Care should be exercised in making the electrical connection to the plug to be sure that the outer jacket of the controller lead is properly squeezed between the sides of the plug walls when the plug is reassembled.

The three pin male plug in the arm of the machine is normally used with the regular line lead, and the controller connection is made through the two pin plug in the bed of the machine. If required, however, a regular line lead with controller combination, having three pin terminal, may be plugged into the male three pin terminal in the arm and proper connections will then exist to operate the machine.

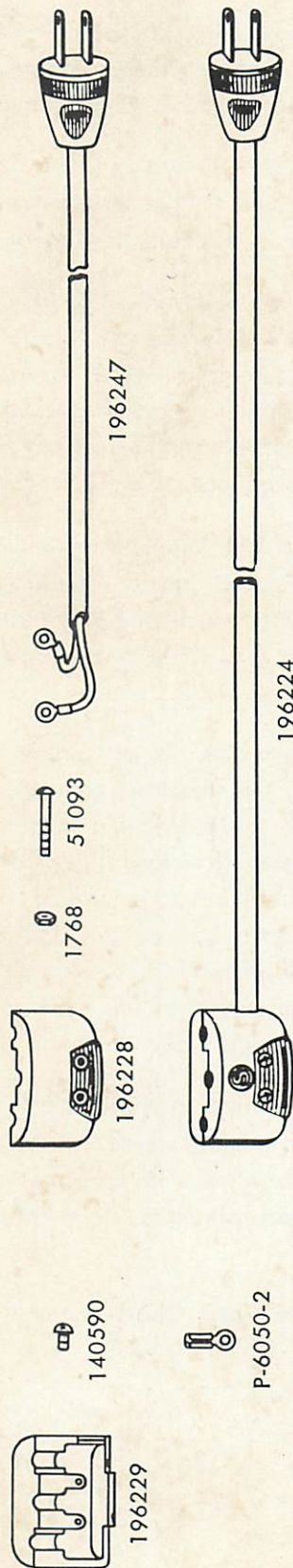
For a description and Service Parts Chart of the SINGERLIGHT used with the Class 301 Machine, see Part 5, Section 1.



HARNESS



LINE LEAD



HARNESS COMPLETE

PART No.	DESCRIPTION	QUAN.
196222	HARNESS COMPLETE	1
196261	CONTROLLER SOCKET (FEMALE)	1
196266	WIRING HARNESS	1
196231	TERMINAL WITH POST	1
196271	LEAD WITH TERMINAL CLIPS	1
196272	CONTROLLER PLUG COMPLETE	1

LINE LEAD COMPLETE

PART No.	DESCRIPTION	QUAN.
196224	LINE LEAD WITH 3-PIN TERMINAL	1
196247	LINE LEAD WITH TERMINALS AND PLUG	1
196228	LINE PLUG (UPPER HALF)	1
196229	LINE PLUG (LOWER HALF)	1
P-6050-2	TERMINAL SLEEVE	2
140590	TERMINAL SCREW	2
51093	PLUG CLAMPING SCREW	2
1768	PLUG CLAMPING SCREW NUT	2

E2/529

HARNESS AND LINE LEAD COMPLETE FOR 301 MACHINE